Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

May 2004

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

May 2004

Project Team:

F Dominic Fanning
Matthew Pauza
Michael Welsh
with the assistance of and input from:

Dr Arthur White of Biosphere Ecological Consultants
HWR Pty Ltd

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

PROPOSED SAND EXTRACTION & KAOLIN MINE
NEWNES JUNCTION

SUPPLEMENTARY SUBMISSION to DIPNR

FLORA & FAUNA ISSUES

May 2004

TABLE of CONTENTS

H The Greater Blue Mountains Area (GBMA) World Heritage Area

PROPOSED SAND EXTRACTION & KAOLIN MINE
NEWNES JUNCTION

SUPPLEMENTARY SUBMISSION to DIPNR

FLORA & FAUNA ISSUES

May 2004

1 INTRODUCTION

1.1 The Proposed Activity

The proposed development involves the extraction of friable sandstone and Kaolin clay using open pit mining methods at a site near Newnes Junction in NSW. The subject site is located to the east of Lithgow, and is adjoined to the south by an existing sand extraction quarry (operated by Rocla) and to the northwest by the existing Clarence Colliery (IEC 2003 - Figure 2.2).

The proposed operation involves the extraction of sandstone material using a dedicated ripping and conveyor system, and transfer to a rail transport system to a processing facility (located elsewhere). Subsequent processing of the raw material will produce kaolin, industrial grade silica sand products and premium quality construction sand. The proposal also involves the implementation of an array of impact amelioration and environmental management measures, designed specifically to protect habitats present on the subject site and downslope or downstream of particular relevance is the presence to the immediate north and east of part of the Blue Mountains National Park (BMNP) and Greater Blue Mountains Area (GBMA) World Heritage Area.

Details of the mining activity (as originally proposed) are provided in the *Environmental Impact Statement* (EIS) which was prepared by International Environmental Consultants Pty Ltd (IEC 2003), and in additional supporting documentation provided by the proponent (Newnes Kaolin Pty Ltd).

1.2 Supplementary Documentation

Subsequent to preparation of the EIS, the *Development Application* and supporting documentation (including the EIS) were placed on public display in 2003. A substantial number of submissions were received in response to the EIS, and the proponents have subsequently been considering a range of measures and options to address many of the issues which have been raised. In addition, supplementary material and information has been collected and collated with respect to a range of matters and issues.

The Department of Infrastructure Planning & Natural Resources (DIPNR) has provided the proponent with the submissions to the EIS, and has requested additional information to assist in the development assessment process. This *Supplementary Submission to DIPNR* ecological presents data derived from supplementary investigations on the site, and additional information regarding flora and fauna.

Specific measures and elements of the project as currently revised and designed, in this regard:

- the implementation of an alternative mining process, involving machinery which rips the sandstone substrate and transfers the material specialised by conveyor for subsequent transport by train and processing;

- an array of measures to be implemented to control noise and dust, and to provide further suppression of these impacts;
- a minor modification to the mine footprint which involves the retention of an area of swampy vegetation in a watercourse in the southeastern part of the site and its protection from mining activities;
- an array of measures associated with stormwater treatment, and the management of water distribution and water quality control, to be implemented as part of the project; and
- other impact amelioration measures associated with the project which have been refined in response to issues raised in the submissions.

These matters are detailed in supplementary documentation provided in this document and by others in response to the proposal and relevant submissions on the applicant. Negotiations and consultation with relevant authorities have also been part of the response to the EIS and submission process.

1.3 Flora & Fauna Issues

A number of the submissions to the EIS raised issues in relation to native biota on the subject site and in the adjoining conservation reserves. Of particular relevance in this regard are issues relating to:

- the adequacy of flora investigations and the description of the natural environment in terms of native flora and vegetation communities, as documented in the EIS;
- the adequacy of fauna surveys undertaken on the subject site and the consideration of native fauna and their habitats, as documented in the EIS, both on the subject site and on adjacent conservation lands;
- the potential for adverse impacts to be imposed upon adjoining habitats for native flora and fauna, particularly the adjoining National Park areas; and
- the potential for adverse impacts to be imposed upon the adjoining Blue Mountains World Heritage Area (as a separate issues from impacts on the natural environment or on the conservation reserves *per se*).

1.4 Role of Supplementary Submission on Flora & Fauna

This *Supplementary Submission* has been prepared to address matters relating to flora and fauna issues raised in the submissions to the original *Development Application* and EIS. The *Report* has incorporated information and data contained in some of those submissions, as well as the information contained in the original EIS documentation and in other published or available material and databases. Specific investigations have also been conducted on the subject site for biota of significance or concern, as raised in several of the submissions.

This *Supplementary Report* provides specific information on and addresses issues which have been raised in relation to:

- flora and vegetation, including the Newnes Plateau Shrub Swamp community and potential threatened flora species;
- flora and fauna habitats, including an array of threatened fauna species and particularly including the Blue Mountains Water Skink;
- the consideration of Section 5A of the *NSW Environmental Planning & Assessment Act 1979* (EP&A Act) as amended by the *NSW Threatened Species Conservation Act 1995* (TSC Act). Whist the original EIS (IEC 2003) contained a Section 5A Assessment in respect of threatened fauna and a separate

assessment in respect of threatened flora, that assessment had utilised the amended Section 5A Assessment which has been passed into legislation but which has not yet been implemented; and

- consideration of the World Heritage Area (WHA) listing of *The Greater Blue Mountains Area* and the potential impacts of the proposed development on the relevant features of that area.

2 FLORA & VEGETATION

2.1 Database

The information on which the consideration and assessment of flora and vegetation on the subject site at Newnes Junction, as contained in this *Report*, was based includes:

- the original investigations of native flora and vegetation conducted for the EIS (IEC 2003). It should be noted that the IEC investigations also included the consideration of information contained in other *Report*s on sites in the immediate vicinity, as well as published scientific papers and other available information;
- data and information contained in submissions on the proposed mining operation and EIS. In particular, the information contained in the submission by P & J Smith has been incorporated into this *Report*, and is regarded as a valuable contribution to the overall information base for the project. Whilst the submission by the NSW National Parks & Wildlife Service (NPWS)[1] does not contain any specific data or records, the matters regarding flora and vegetation contained in that submission have been considered in this *Report*; and
- the supplementary investigations for flora and vegetation undertaken specifically for this *Supplementary Report* on the proposed mining operation at Newnes. The supplementary investigations include a dedicated 3-day flora survey by HWR Pty Ltd (Appendix A) and a 1-day investigation by Dr A White of Biosphere Consultants in mid-March 2004 (Appendix B).

On the basis of the total quantum of investigations for flora and vegetation which have now been undertaken on the subject site at Newnes (IEC 2003; P & J Smith 2003; Biosphere 2004; HWR 2004) and other previous investigations for flora undertaken on other lands in the immediate vicinity (Corkery & Co 1993; IEC 2000), it can be reasonably asserted that a comprehensive and adequate investigation for native flora and vegetation communities has now been achieved.

Data from all of the investigations undertaken on the subject site, as well relevant information from adjoining lands and other studies, has been incorporated into this *Report*. The combined information constitutes the database upon which analysis and assessment of the proposed activity is determined.

2.2 Flora Species

The assemblage of flora species which have been recorded on the subject site at Newnes to date is the culmination of a number of investigations, including those by IEC (2003), P & J Smith (2003), Biosphere (2004) and HWR (2004). In terms of threatened flora species, the results of other investigations undertaken in the immediate vicinity have also been considered (Corkery & Co 1993; IEC 2000).

A total of 171 flora species, including introduced plants and weeds have been recorded on the subject site at Newnes (Appendix C). Whilst the total number of flora species present on the subject site is likely to be greater than that identified to date, the total inventory which has been established is regarded as a reasonable approximation of the full suite of flora species present.

[1] The NPWS has recently been incorporated into the NSW Department of Environment & Conservation (DEC).

It is, nearly always possible to locate additional species on a site as large as that at Newnes by the conduct of further investigations. However, the accumulated information from the investigations conducted to date can reasonably be considered to constitute a comprehensive and adequate database for the site.

The suite of flora species which have been recorded on the site constitutes a sub-sample of that which would occur within the adjoining National Parks and World Heritage Area. The subject site contains only a small sample of the habitats and environments present within that extensive landscape, and the site could therefore support only a sub-set of the species contained within the Blue Mountains National Park or the GBMA World Heritage Area.
It is of particular note that not a single threatened flora species has been recorded by any of the investigators who have conducted surveys on the subject site at Newnes. Whilst it is doubtless possible that individuals or stands of some threatened species could potentially occur on the site, there has to date been no evidence for the presence of any such species.

Eighteen threatened plant species have been listed on the Wallerawang 1:100,000 Map Sheet (HWR 2003 - Appendix A). Of these species:

- four are considered unlikely to occur on the site as the habitat present is only "*marginal*";
- six are also regarded as unlikely to occur because the habitat present is only of "*minimal*" relevance, particularly given the absence of rocky habitats; and
- the remaining eight species were not recorded on the subject site during any investigations conducted to date, despite some "*moderate*" habitat being present.

As indicated above, none of these species had been recorded by any of the researchers who have investigated the subject site at Newnes during any previous studies.

2.3 Vegetation Communities

As indicated in the detailed *Report* by HWR Pty Ltd (2004) and in the submission by P & J Smith (2003), the subject site is predominantly characterised by an open forest/woodland community of Silvertop Ash and Sydney Peppermint. This community is also described as Blue Mountains Sandstone Plateau Forest (BMSPF), and was mapped as that community in the original vegetation mapping provided in the EIS by IEC (2003).

However, there are small patches of other vegetation communities present on the subject site, including:

- a small area of Newnes Plateau forest in the southwestern part of the site (HWR 2004);
- an area of open forest with a higher density of Scribbly Gums (a variant of the BMSPF) in the northern part of the site (HWR 2004);
- some riparian vegetation along the narrow drainage lines which traverse the site. This vegetation type is a variant of the sandstone ridgetop vegetation community, with a component of riparian or moister plant types; and
- small areas of swamp or near-swamp communities within the drainage lines, although these are generally of very restricted distribution. The relatively steep slopes and rapid draining characteristics of the site are not conducive to the establishment of extensive swamp communities. Nevertheless, some small patches of shrub swamp vegetation are present in isolated locations (as discussed in detail below).

Most of the vegetation on the subject site is of an open forest or woodland structure, and may be described as a dry sclerophyll community which is characterised by relatively dry soils, an open to moderate dense shrub layer and a sparse (but locally dense) understorey

layer. This type of vegetation is generally adapted to relatively dry or xeric conditions, such as are typical of the rapidly draining nature of the site and of the soils.

Given those circumstances, vegetation which requires a high soil moisture level is relatively restricted on the subject site (as is typical of much of the sandstone country within the Blue Mountains). Drainage lines on the site are generally narrow and do not support broad areas of soil with a high moisture content. As a consequence, vegetation which requires such circumstances (such as riparian, swamp or wet heath type communities) are only located in restricted portions of the site.

The vegetation mapping by HWR (2004) identifies the presence of riparian or swampy vegetation along two drainage lines which traverse the site. Of these, the northern (central) drainage line is relatively narrow and steep, and supports only very small, isolated and limited areas of swampy or moister riparian vegetation. This community is regarded as a variant of the drier eucalypt forest vegetation on the site. The southern drainage line, conversely, supports a somewhat broader area of moister vegetation, although the abiotic and floristic characteristics of that area do not identify it as a 'swamp' (see Appendix A).

Nevertheless, the vegetation in that portion of the site is considered as having some affinities to the Newnes Plateau Shrub Swamp community, as discussed in detail below. The drainage lines to the east of the subject site do support larger areas of swamp-type vegetation, as a consequence of local topographic features and their general structure.

Development of the mine plan has been cognisant of the critical need to protect habitats downstream of the subject site, particularly areas of riparian or swamp vegetation which may occur along drainage lines within the National Park. The mining operation incorporates a number of measures specifically designed to protect those habitats and resources downstream and downslope of the site, particularly within the GBMA World Heritage Area and in the BMNP.

2.4 Newnes Plateau Shrub Swamp

Amongst the issues raised in the submissions on the *Development Application* and EIS for the proposed mining operation is the possible presence of the Newnes Plateau Shrub Swamp (NPSS) community on the subject land.

This plant community was originally described by Benson & Keith (1990), and is defined as "*Narrow, elongate, shrub-swamps*" which are restricted to the "*eastern half of the Newnes Plateau*" (Appendix D). These swamps "*are formed in characteristic low-slope head water valleys*" where "*sediments are relatively deep … and are periodically water logged*" (Benson & Keith 1990). These elements of the community are significantly in distinguishing NPSS from other moist or riparian habitats in the locality.

The supplementary flora investigations of the subject site have included specific investigation of this plant community and its presence (or otherwise) on the subject site. It had been asserted by P & J Smith (2003) and the NPWS (2003) that this community is or may be present on the site. As a consequence, specific investigations of potential areas for this community were undertaken (Appendices A and B).

Consideration of the characteristics of the NPSS community, and of vegetation on the subject site and the physical features of those portions of the landscape, has resulted in the conclusions that:

- the drainage line which traverses the central part of the subject site, whilst supporting very small and isolated patches of swampy vegetation, does not support the association identified as the NPSS community. This drainage line:
  - is very narrow and relatively steep;
  - does not support areas of long-term moist soil (other than potentially in extremely small areas); and

- does not contain the characteristic floristics of the NPSS community.

This vegetation, therefore, has been designated riparian (swampy) vegetation in the *Report* prepared by HWR (Appendix A); and

- the southernmost drainage line through the subject site supports a small area of relatively moist soil with a sparse tree canopy. This area is characterised as a shrubland dominated by the Tea-tree *Leptospermum trinervum*, and supports a number of the plant species identified in the description of the NPSS community. However, few of the plant species present are indicated as dominant within the NPSS community, and the vegetation present is regarded at best as a marginal example of that community or a variant thereof.

It is to be noted that the NPSS community is not listed as an "*endangered ecological community*" on the TSC Act. This 'community' does not therefore warrant specific or special consideration pursuant to the statutory processes within NSW.

A nomination has been received by the Commonwealth Department of Environment & Heritage (DEH) for the listing of Blue Mountains Swamps as a "*threatened ecological community*" on the *Commonwealth Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act). The NPSS community is part of that complex of swamp communities, but a number of other swamp communities is also part of the nomination, occurring over a much larger area than the NPSS vegetation. The Blue Mountains Swamp communities have not yet been listed on the EPBC Act, and the NPSS community constitutes only one element of that matrix of vegetation types.

As discussed above and in detail in the relevant vegetation *Reports* (Appendices A and B), the subject site supports only one small area of vegetation supporting affinities with (or which could potentially be described as) the NPSS vegetation. That area (in the southeast of the site) has been identified for retention, and the mine plan has been modified to avoid and protect that area of swamp vegetation. Measures of relevance in this regard include:

- retention of the area of swamp vegetation within the southeastern part of the site;
- provision of a 50m buffer to that vegetation;
- the re-routing of natural stormwater runoff from above the mining operation and its discharge into the retained swamp vegetation; and
- a program of monitoring and management of that portion of the site.

3 FAUNA & HABITATS

3.1 Database

The information on which the consideration and assessment of fauna and fauna habitats on the subject site at Newnes contained in this *Report* was based includes:

- the original investigations of native fauna and vegetation conducted for the EIS (IEC 2003). It should be noted that the IEC investigations also included consideration of information contained in other *Report*s on sites in the immediate vicinity, published scientific papers and other available information;
- data and information contained in submissions on the proposed mining operation and EIS. In particular, the information contained in the submission by P & J Smith has been incorporated into this *Report*, and is regarded as a valuable contribution to the overall information base for the project;
- dedicated supplementary fauna surveys undertaken on the subject site over a period of 4 days and 3 nights in March 2004 by Gunninah Environmental Consultants (Appendix E). Surveys were undertaken for the full suite of native fauna species, with particular attention paid to the possible presence of the Blue Mountains Water Skink *Eulamparus leuraenisis* and microchiropteran bats;
- a specific survey was also undertaken by Dr A White of Biosphere Consultants in mid-March 2004 (Appendix B) for the Blue Mountains Water Skink.

The supplementary fauna surveys undertaken by Gunninah (Appendix E) included:

- the deployment of cage traps and Elliott traps for terrestrial and arboreal mammal fauna;
- call playback of a variety of species at several locations across the subject site;
- the deployment of harp traps for microchiropteran bats;
- the use of an Anabat II ultrasonic detector for microchiropteran bats;
- the conduct of spotlighting surveys along existing tracks and trails on the site;
- the conduct of extensive diurnal surveys for native fauna and/or for indirect evidence of their presence across the subject site; and
- inspection and mapping of relevant resources on the subject site (such as hollow-bearing trees).

3.2 Habitat Features and Resources

As discussed in the *Supplementary Fauna Report* for the proposed development at Newnes (Appendix E), the site supports very little by way of rock outcrops or rock shelters, and no caves were recorded. Consequently, species which utilise or depend on this type of resource (*eg* the Broad-headed Snake) are not likely to be present on the site.

The watercourses on the site are generally relatively steep and narrow, and do not hold water for significant periods. The absence of permanent ponds or significant moist areas on the site also limits the potential array of native fauna which could be present. In this regard, areas of swampy vegetation or habitat are extremely limited, and only one area which appears to maintain a generally moist soil condition is present in the southeastern part of the site. Ephemeral ponds or pools of free-standing water, are present at limited locations across the subject site. The marginal nature and extent of moist or swamp habitats present limits the likelihood of the Blue Mountains Swamp Skink being present on the subject site.

The subject site does support an array of hollow-bearing trees, although there are few substantial 'old-growth' trees present. The trees-hollows present on the site (Appendix E) are relatively small or of only moderate size, and would not be of value for species such as

the Glossy Black Cockatoo or the large forest owls. Conversely, these hollows do provide resources and shelter for microchiropteran bats, forest birds (such as parrots and kingfishes) and some arboreal mammals.

3.3 Fauna Assemblage

A total of 98 fauna species have been recorded on the subject site at Newnes Junction (Appendix F) as a consequence of the field investigations conducted to date (IEC 2003; Biosphere 2003, 2004; P & J Smith 2003; Gunninah 2004). Further native fauna species have been recorded on other lands in the immediate vicinity (IEC 2000; Corkery 1993), and a number of additional species would be expected to occur under appropriate climatic or seasonal circumstances.

The total fauna assemblage which could utilise the subject site is doubtless more extensive than that identified to date. A number of species which are present in the adjoining conservation reserves are also likely to utilise the subject site during appropriate seasonal or climatic circumstances.

3.4 Threatened Species

The only threatened fauna species which have been recorded from the subject site at Newnes Junction are two microchiropteran bats (the Common Bent-wing Bat and the Eastern False Pipistrelle). Other threatened species recorded in the immediate vicinity over the course of investigations conducted include the Yellow-bellied Glider and the Koala, which have been recorded on adjacent land but not on the subject site (IEC 2000). It is possible, however, that both of these species do utilise the subject site, at least on occasions.

The Eastern False Pipistrelle (or Eastern False Pipistrelle) generally roosts in tree-hollows in eucalypts, but has also been recorded roosting in caves and buildings (Churchill 1998). This species occurs in southern Queensland, eastern NSW and southern and eastern Victoria, as well as in Tasmania, and is regularly recorded during field investigations.

The subject site provides suitable resources for the Eastern False Pipistrelle, including hollow-bearing trees and a native tree canopy through which to forage. Whilst it is likely that individuals or colonies of the Eastern False Pipistrelle are present on the subject site at Newnes, this species is also likely to be widespread in the extensive conservation reserves in the immediate vicinity, locality and region. The subject site does not support restricted or limited resources for the Eastern False Pipistrelle, and it is not likely that individuals or colonies would be restricted to or dependent on the subject site itself.

Similar considerations apply with respect to the Common Bent-wing Bat. However, this species roosts in caves and man-made structure (including mines and culverts), and there are no suitable roosting habitats for the Common Bent-wing Bat on the subject site at Newnes.

The Common Bent-wing Bat occurs throughout eastern Australia in a band up to several hundred kilometres east of the coast. It is a common species which is regularly (almost invariably) recorded during dedicated microchiropteran bat surveys, and utilises both natural woodland and forest habitats as well as highly modified urban environments. As noted above, the subject site at Newnes does not currently provide roosting resources for the Common Bent-wing Bat, but individuals of this species doubtless utilise the forest canopy for foraging purposes. The subject site, however, constitutes only a minute proportion of suitable habitat for this species in the locality and region.

A dedicated survey was undertaken for the Blue Mountains Water Skink within the moister habitats on the subject site (Biosphere 2004; Appendix B). It is noted by Dr A White of Biosphere Consultants that the subject site does not support habitat of value or suitable moisture regimes for the Blue Mountains Water Skink, but there is potentially suitable habitat in the World Heritage Area downslope (to the east of) the subject site. Given the

circumstances on the site itself, the lack of any records of the Blue Mountains Water Skink is not a surprise. By contrast, Dr A White has recorded the Blue Mountains Water Skink elsewhere on the Newnes Plateau, including in several natural swamps on land nearby and in a tailings dam on the adjacent sand extraction site (A White *pers comm*).

The Yellow-bellied Glider has not been recorded on the subject site, despite the implementation of appropriate survey methods (including spotlighting, call playback and inspection of trees for the characteristic feeding notches of this species). Given the nature of the forest and woodland vegetation on the site, it is not considered particularly likely that Yellow-bellied Gliders would be present. This species tends to use forest communities of a somewhat higher productivity and moisture level than is the case on the subject site at Newnes Junction.

Nevertheless, Yellow-bellied Gliders could potentially utilise the subject site for foraging purposes and could potentially utilise tree-hollows on the site for shelter. It is not likely, however, that the subject site constitutes a significant resource for this species given its nature and condition, and given the lack of evidence for Yellow-bellied Gliders on the subject site. Furthermore, the site constitutes only a minute proportion of the extensive forested habitats in the immediate vicinity and general locality.

Similarly, whilst the Koala has been recorded on adjacent lands, there is no record of this species from the subject site. As is the case with the Yellow-bellied Glider, the forest vegetation present does not provide resources of particular value or significance for the Koala. None of the trees present constitutes a significant or notable foraging resource for the Koala, although the species does utilise a range eucalypts (including the Scribbly Gums) for foraging purposes throughout its distributional range. The subject site generally, however, does not support resources which could be regarded as of significance for the Koala, and the lack of evidence for this species on the subject site is not surprising.

None of the threatened forest owls known to occur in the general locality was recorded on the subject site during any investigations undertaken to date (IEC 2003; P & J Smith 2003; Gunninah 2004). As noted above, the tree-hollows present on the site are generally too small for the large forest owls, and use of the site would consequently be restricted to foraging activities as part of a much larger home range. The forest vegetation on the site does not support a notable or particularly abundant arboreal mammal population, and the subject site cannot be regarded as of significance for any of the threatened forest owl species, even if individuals of such species are present on the site or in the immediate vicinity. However, given the wide-ranging nature of these species and their ability to use various types of forest vegetation, it is considered likely that individuals of those species could utilise the site on occasion.

Several submissions to the EIS suggested the possible use of the site by the Tiger Quoll (Spotted-tailed Quoll). Whilst it is certainly possible that individuals of this species are present on the site, there is no evidence (either direct or indirect) for its presence. Furthermore, the subject site generally provides only limited or marginal resources or habitats for this species, and constitutes only a minute proportion of suitable or potentially suitable habitat and resources in the immediate vicinity and general locality.

Whilst there are a number of other threatened fauna species which could potentially occur on the subject site at Newnes, the site is not regarded as of particular significance or relevance because:

- the site constitutes only a minute fraction of potentially suitable habitat in the vicinity, locality or region. This is particularly so given the extent of conservation reserves in the Sydney Basin Bioregion and the extent of conserved habitats within the GBMA World Heritage Area (exceeding 1 million hectares);
- there are no resources or habitat features of particular significance or value which are restricted to the subject site;
- the proposed development is located at the periphery of extensive conservation areas, and will not therefore intrude into these areas;

- the vegetation and habitats on the site are of limited inherent value for the threatened species which could potentially occur; and
- there is no evidence for other threatened fauna species which would be likely to be threatened or placed at by the proposed operation, or which would be reliant or dependent on the site itself.

Given the considerations above, it is not likely that the subject site constitutes a significant or critical resource for any threatened fauna species. It cannot be regarded as likely that any such threatened biota would be reliant on or dependent on the subject site for their survival in this locality. The proposed development does not therefore constitute a significant adverse impact on or a significant threat to any such biota or their habitats.

4 SECTION 5A ASSESSMENTS of SIGNIFICANCE

4.1 Assessments in EIS

The original EIS prepared by IEC (2003) provided an Assessment of Significance pursuant to Section 5A of the *NSW Environmental Planning & Assessment Act 1979* (EP&A Act). However, as indicated in the submission provided by the NPWS (DEC), the s.5A Assessments which were provided in the EIS were based on the recently gazetted (but not yet implemented) modifications to s.5A of the EP&A Act.

Whilst the amended s.5A Assessment is considered generally to be a more appropriate regime for consideration of the likelihood or otherwise of a "*significant effect*" being imposed upon any "*threatened species, populations or ecological communities, or their habitats*", it is not appropriate at this point to utilise the amended s.5A Assessment. As a consequence, this *Supplementary Submission to DIPNR* provides a s.5A Assessment of Significance for native biota which utilises the original eight factors contained in s.5A of the Act (Appendix G).

4.2 Supplementary Consideration of s.5A

This *Supplementary Submission* provides (in Appendix G) a detailed Assessment of Significance pursuant to s.5A of the EP&A Act in respect of:

- the Koala and Yellow-bellied Glider, which have been recorded on lands nearby but not on the subject site itself. The site does not appear to constitute important or valuable habitat for either of these species;
- the Common Bent-wing Bat and Eastern False Pipistrelle, both which have been recorded on the site;
- other microchiropteran bats known or likely to occur on the site, all of which are highly mobile and wide-ranging. The subject site constitutes only a minute proportion of suitable habitat for these species in the locality and region;
- the large forest owls, no evidence for the presence of which has been recorded on the site. Nevertheless, these wide-ranging and highly mobile species could potentially occur on the site on occasions, as part of their activities over a much greater home range;
- the Blue Mountains Water Skink and Red-crowned Toadlet, although no evidence for either species has been recorded on the site. Nevertheless, there are suitable habitats in the immediate vicinity and these two species have been considered on a precautionary basis;
- the Tiger Quoll, which is known to occur in the general locality but has not been recorded on the subject site. As for most of the other species, the subject site does not constitute a significant area of habitat for the species, particularly in comparison to the vast areas of conservation reserves in the locality and region; and

- threatened plant species which could potentially occur on the subject site, although no specimens of any such species have been recorded. The subject site is not regarded as constituting a significant area of known habitat for any such species, given the extent of conservation reserves in the immediate vicinity, general locality and region.

A generic consideration of the eight factors of s.5A of the EP&A Act is also provided in this *Report* (below) to consider the potential for the proposed mining operation to impose adverse impacts upon any such species or their habitats. That generic analysis does not involve detailed analysis of the specific habitat requirements of other threatened biota which could potentially occur on the site. However, consideration of the project and of the impact amelioration measures proposed for the development, and the nature of those areas to be affected by the development, enables an appropriate consideration of the likelihood or otherwise of "*a significant effect*" being imposed upon any other "*threatened species, populations or ecological communities, or their habitats*".

4.3 Generic Section 5A Assessment of Significance

There are no listed "*endangered ecological communities*" or "*endangered populations*" present on the subject site or in the immediate vicinity. There is therefore no requirement for consideration of s.5A of the EP&A Act in respect of these biota.

There is therefore no requirement for consideration of s.5A of the EP&A Act in respect of these biota.

With respect to other threatened species or their habitats which could occur on the subject site at Newnes, the eight factors of s.5A of the EP&A Act have been considered with respect to the likelihood or otherwise of the proposed mining operation imposing "*a significant effect*":

- it is not considered likely that a "*viable local population*" of any of the additional potential threatened species would be dependent or reliant on the subject site, given the habitats present and their extent in adjoining reserves. Development of the subject site as proposed is not "*likely*" to involve a "*viable local population*" of any threatened species (even if present) being placed "*at risk of extinction*" (Factor a);
- there is no relevant "*endangered population*" listed on the TSC Act as occurring on the subject site or in the vicinity (Factor b);
- the proposed development of the subject site will not involve "*a significant area of known habitat*" (in terms of the "*regional distribution of the habitat*") for any threatened biota being "*modified or removed*", particularly given the vast areas of similar habitats and resources protected in the adjoining and regional conservation reserves (Factor c);
- the subject site is at the periphery of conserved lands and urban development, and does not contribute to "*currently interconnecting or proximate areas of habitat*" for any threatened biota. Consequently, the proposal will not isolate any such areas (Factor d);
- there is no relevant "*critical habitat*" currently declared within NSW (Factor e);
- "*threatened species, populations or ecological communities, or their habitats*" are generally not regarded as "*adequately represented in conservation reserves (or other similar protected areas) in the region*". However, the proposed development of the subject site will not affect the conservation status or the adequacy of conservation of any threatened biota or their habitats (Factor f);
- the TSC Act defines a "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Schedule 3 of the TSC Act provides a list of identified "*key threatening processes*".

The proposed mining operation at Newnes will require the "*clearing of native vegetation*" which has been listed as a "*key threatening process*" on the TSC Act. However, the area of "*native vegetation*" to be removed is minute by comparison with the extent of native vegetation in the vast conservation reserves in the immediate vicinity, locality and region. Given that circumstance, the proposed development is not regarded as contributing in any significant manner to "*key threatening processes*".

Given the considerable extent of conservation reserves and protected habitats in the immediate vicinity, locality and region, and given the lack of specific or restricted resources on the subject site, it is not regarded as likely that the proposed mining operation would "*threaten the survival or evolutionary development of* [any] *species, populations or ecological communities*". On that basis, the proposed development does not constitute a "*threatening process*" as defined in the TSC Act (Factor g);

- none of the additional threatened biota which could theoretically occur on the subject site is "*at the limit of its known distribution*" on the site (Factor h).

Given the above considerations, and other relevant matters (particularly the extent of conservation reserves, the size and location of the site and the regional distribution of potentially relevant species), it cannot be construed as "*likely*" that the proposed mining operation at Newnes, as currently proposed, would impose "*a significant effect on threatened species, populations or ecological communities, or their habitats*".

4.4 Conclusions

The consideration of the relevant factors of s.5A of the EP&A Act with respect to the likelihood or otherwise of "*a significant effect*" being imposed upon any "*threatened species, populations or ecological communities, or their habitats*" is provided above (Chapter 4.3) and in Appendix G to this *Report*. Given the extent of conservation reserves in the immediate vicinity, general locality and region, and the context and circumstances of the proposed development, it is not considered likely that any "*threatened species, populations or ecological communities, or their habitats*" would be subjected to the imposition of "*a significant effect*" as a result of the proposed mining operations at Newnes.

There are no threatened biota which could conceivably be restricted to the subject site, or to habitats thereon. Furthermore, the vegetation types and habitats or resources present on the subject site for the most part are widely distributed and extremely well conserved in the Sydney Basin Bioregion. The small swampy patches on the site are not significant in respect of the distribution and/or conservation of swamp communities within the Blue Mountains. The larger swampy area is, in any case, to be retained and protected.

The subject site does not support any resources or habitat features of restricted distribution or particular conservation significance or value, and the proposed mining operation will implement an array of impact amelioration and environmental management measures to avoid or minimise adverse impacts upon the natural environment.

5 WORLD HERITAGE AREA ISSUES

5.1 World Heritage Area Listing

The Greater Blue Mountains Area (GBMA) World Heritage Area was inscribed in 2000 on the World Heritage list. The GBMA is described as "*an area of breathtaking views, rugged tablelands, sheer cliffs, deep, inaccessible valleys and swamps teeming with life*". The area is described as providing a representation "*of the evolution of Australia's unique eucalypt vegetation and its associated communities, plants and animals*" (Appendix H).

The information available from the Australian Department of Environment & Heritage (DEH) states that the "*Greater Blue Mountains Area consists of 1.03 million hectares of mostly forested landscape on a sandstone plateau 60 to 180 kilometres inland from central Sydney, New South Wales. The property includes vast expanses of wilderness and is equivalent in area to almost one third of Belgium, or twice the size of Brunei*" (Appendix H).

The GBMA was inscribed on the World Heritage list on the basis of two natural criteria (Appendix H):

- natural criterion (ii)

  "*outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals*"; and

- natural criterion (iv)

  "*contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation*".

In addition to being part of the GBMA World Heritage Area, adjoining land to the east of the proposed mine site at Newnes is part of the Blue Mountains National Park (BMNP). The NSW National Parks & Wildlife Service (NPWS)[2], and their submission on the proposed mining operation and the EIS, raised concerns regarding the potential for adverse impacts to be imposed upon the BMNP and the GBMA.

The major concerns of the DEC in relation to the BMNP and GBMA relate to the potential for adverse impacts to be imposed by erosion and sediment discharge from the mine site and by a potential decline in water quality discharged from the site into the conservation reserves. Other matters raised by the DEC include:

- the potential for disturbance arising from noise and dust emanation and vibration during mining operations;
- the visual impacts of the proposal;
- concerns regarding rehabilitation of the mine site;
- impacts on recreational values in the adjoining National Park; and
- the adequacy of the proposed 50m buffer around the mine site.

5.2 Potential Impacts on World Heritage Area Values

The main concern regarding the potential of the proposed mining operation to impose adverse impacts upon the BMNP and GBMA World Heritage Area is the possibility of sediment and erosion discharges into the watercourses of those conservation reserves and the discharge of contaminated stormwater. The concern has been expressed that a deterioration in water quality within the headwaters of the Wollangambe River will occur as a result of the proposed mining operation.

[2] The NPWS has recently been incorporated into the NSW Department of Environment & Conservation (DEC).

The measures which are either inherent in the mining operation itself or which are to be implemented as environmental management and impact amelioration measures for the project are detailed either in the original EIS or in the supplementary documentation which describes the proposed modified mining process.

It is of critical importance in this regard that:

- no processing of material is to occur on the site at Newnes, and there is therefore considerably less opportunity for the contamination of surface waters than is the case on the adjoining extraction site;
- mining will be by way of specialised machinery which rips the rock substratum and transfers the raw material by conveyer for transport by train to an off-site processing plant. Consequently, there will be no generation of significant quantities of sediment or sediment-laden stormwater on the site;
- stormwater generated within the mine site is to be retained, treated and used for on-site dust suppression, irrigation of rehabilitation areas, watering of nursery plants and distribution to the Newnes Junction village; and
- clean surface water from upslope will be directed around the mine footprint and into protected watercourses downstream of the mine.

The measures described above will ensure the protection of habitats and watercourses downstream and downslope of the proposed mining operations, and will provide for the re-use of stormwater (following treatment) generated on the site. This approach has been adopted to minimise or avoid the imposition of adverse impacts on watercourses and habitats downstream of the proposed mine site, particularly within the BMNP and GBMA World Heritage Area.

The original nomination document for the GBMA World Heritage Area considered a number of pressures which may impact on the GBMA, and provides some recommended responses to those pressures. Urban development, water management and coal mining are identified as likely pressures on the GBMA, and specific responses to these pressures have been provided. It is of note that the extraction of sand and kaolin is not identified as a pressure of concern to the GBMA.

Nevertheless, the responses to potential pressures identified in the nomination document for the GBMA have been considered with respect to the sand and kaolin extraction activity proposed at Newnes. In particular, the responses identified for coal mining adjacent to the GBMA have been considered, and these have been adopted for the sand and kaolin activities at Newnes (where appropriate or relevant). In addition, responses identified in the water management and urban development sections of the original nomination document (Chapter 5) have been considered.

In this respect:

- the proposed mining operation has incorporated an array of measures specifically designed to prevent the contamination of stormwater which will be discharges and to control erosion and sediment discharged into the GBMA;
- subsidence is not an issue for the proposed sand and kaolin extraction process because the proposal is an open-cut mine;
- the proposal has been the subject of intensive consideration and assessment pursuant to the *NSW Environmental Planning & Assessment Act* (EP&A Act), and has been supplemented and/or modified in response to comments on the EIS; and
- there is not likely to be any adverse impacts *on "escarpments, cliffs and geological formation such as 'rock pagodas'"* as a result of the sand extraction process, either within the site or in the adjacent GBMA.

Given the considerations detailed within the EIS and the relevant associated and supplementary documentation, the proposed sand mining operation at Newnes is not regarded as likely to impose adverse impacts upon the GBMA World Heritage Area. The proposal involves the use of 'best practice' and innovative mining measures to avoid adverse impacts upon that conservation area, in excess of those originally proposed and beyond those which are implemented on other extraction operations in the immediate vicinity.

6 CONCLUSIONS

This *Supplementary Submission* regarding the potential impacts on native flora and fauna of the mining operations at Newnes Junction has taken into consideration matters and issues raised in a number of submissions to the original EIS. Of particular relevance have been matters identified by the Department of Environment & Conservation (DEC) and by P & J Smith (2003).

Modifications have been made to the proposed mining activity which include:

- the use of an alternative extraction method and specialised mining machinery which reduces significantly the potential for discharge of noise and dust, and which also reduces the potential for erosion and sediment discharge;
- a modification to the mine footprint to retain an area of swampy vegetation in the southeastern part of the site; and
- further refinement of the stormwater treatment measures to be implemented as part of the *Development Application*.

In respect of matters raised by the DEC and by others (including P & J Smith) in response to the original EIS:

- supplementary flora and fauna investigations (as documented in this *Supplementary Submission*) to address the issues and matters raised by the DEC, P & J Smith and others. In this regard, data provided by P & J Smith (2003) have been incorporated into the final documentation contained herein;
- the proposed new mining method will substantially reduce the generation of dust and noise as a consequence of the mining machinery which is to be involved. In addition to a reduction in both noise and dust emissions, there will be a reduction in material available for erosion and/or sediment discharge within the mine area, thereby substantially reducing the potential for adverse impacts on adjoining lands;
- the mine footprint has been adjusted to avoid the swampy vegetation along the watercourse in the southeastern part of the site. Whilst this vegetation does not appear to fully satisfy the criteria which describe the Newnes Plateau Shrub Swamp community, the protection of this small area of vegetation has been incorporated into the project to reduce the overall environmental impact of the activity;
- the 50m buffers to the BMNP and GBMA are regarded as adequate and appropriate given that there will be no discharge of stormwater or of any contaminants from the mine area through these portions of vegetation; and
- the proposed final landform involves extensive areas of rehabilitation and bush regeneration within the excavation area and the provision of a permanent freshwater swamp in the final void to provide water quality treatment and to provide habitat for native biota known to occur in the general area.

Given the modifications to the development design and the additional material provided in this *Supplementary Submission*, it is concluded that:

- the mining operation will not impose an adverse impact upon the Newnes Plateau Shrub Swamp community, given that:

- it is arguable whether that community is present on the site in any case; and
- the only area of vegetation which has affinities with that plant community (in the southeastern part of the site) is to be retained and protected;
- there is no evidence of or suitable habitat for the Blue Mountains Swamp Skink on the subject site, and potential habitat for this species downstream (in the GBMA) is to be protected from mining activities;
- the proposed mining operation would not threaten the survival or evolutionary development of any native biota, including "*threatened species, populations or ecological communities*" given the small area to be affected, the lack of critical or restricted resources and habitats, and the extent of conservation reserves in the immediate vicinity, locality and region;
- there is not likely to be a "*significant effect*" on any "*threatened species, population or ecological community, or its habitat*" pursuant to Section 5A of the *NSW Environmental Planning & Assessment Act 1979* (EP&A Act). There is, therefore, no requirement for the preparation of a *Species Impact Statement* (SIS) for this proposal; and
- specific measures have been incorporated into the proposal to avoid or minimise adverse impacts upon the adjoining Greater Blue Mountains Area (GBMA) World Heritage Area or on the Blue Mountains National Park (BMNP). Furthermore, the subject site constitutes only a very small (minute) disturbance on the periphery of those substantial conservation reserves, and the activity, even on a 'worst case scenario', could potentially adversely affect only a minute proportion of those areas. However, the proposal does not intend to impose adverse impacts upon either the BMNP or the GBMA.

BIBLIOGRAPHY

Barker J and Grigg G. 1977. *A Field Guide to Australian Frogs*. Rigby, Sydney.

Benson DH and Keith DA 1990. The natural vegetation of the Wallerawang 1:100,000 map sheet. *Cunninghamia* 2(2): 305-335.

Bishop A. 1996. *Field Guide to the Orchids of New South Wales and Victoria*. NSW University Press, Kensington.

Briggs JD and Leigh JH. 1996. *Rare or Threatened Australian Plants*. CSIRO, Collingwood.

Christidis L and Boles WE. 1994. *The Taxonomy & Species of Birds of Australia & its Territories*. Royal Australasian Ornithologists Union, Monograph 2, Melbourne.

Churchill S. 1998. *Australian Bats*. New Holland Publishers, Australia

Cogger HG. 2000. *Reptiles & Amphibians of Australia Sixth Edition*. Reed New Holland, Australia.

Corkery & Co. 1993. *Environmental Impact Statement for the Proposed Northern Extension of Underground at Clarence Colliery*. RW Corkery & Co Pty Ltd, Orange.

Cropper SC. 1993. *Management of Endangered Plants*. CSIRO Publishing, Melbourne.

Debus SJS and Rose AB. 1994. The Masked Owl *Tyto novaehollandiae* in New South Wales. *Australian Birds* 28: 40-55.

Debus SJS and Chafer SJ. 1994. The Powerful Owl *Ninox strenua* in New South Wales. *Australian Birds* 28: 21-39.

Duncan A, Baker B and Montgomery N. 1999. *The Action Plan for Australian Bats*. NPWS, Canberra.

Eby P. 1995. *Biology and Management of Pteropus in New South Wales*. NSW National Parks & Wildlife Service, Hurstville.

Ehmann H. 1992. *Encyclopedia of Australian Animals - Reptiles*. Angus & Robertson, Australia.

Ehmann H (*ed*). 1997. *Threatened Frogs of New South Wales: Habitats, Status and Conservation*. Published by Frog and Tadpole Study Group of NSW Inc, Sydney.

Fairley A and Moore P. 1995. *Native Plants of the Sydney District*. Kangaroo Press Pty Ltd, Sydney.

Garnett S. 1992. *Threatened & Extinct Birds of Australia*. Royal Australasian Ornithologists Union & NPWS, Melbourne.

Garnett T and Crowley GM. 2000. *The Action Plan for Australian Birds*. Environment Australia.

Harden GJ (*ed*). 1990. *Flora of New South Wales*. *Volume 1*. New South Wales University Press, Kensington.

Harden GJ (*ed*). 1991. *Flora of New South Wales*. *Volume 2*. New South Wales University Press, Kensington.

Harden GJ (*ed*). 1992. *Flora of New South Wales*. *Volume 3*. New South Wales University Press, Kensington.

Harden GJ (*ed*). 1993. *Flora of New South Wales*. *Volume 4*. New South Wales University Press, Kensington.

Harden GJ and Murray LJ (*eds*). 2000. *Supplement to Flora of New South Wales*. *Volume 1*. University of New South Wales Press, Sydney.

Higgins PJ. 1999. *Handbook of Australian, New Zealand & Antarctic Birds Volume 4*. Oxford University Press, Melbourne.

Higgins PJ and Davies SJJF. 1996. *Handbook of Australian, New Zealand & Antarctic Birds*. *Volume 3*. Oxford University Press, Melbourne.

HWR. 2004. Flora Assessment. Sand Extraction and Kaolin Project. Newnes Junction. HWR Pty Ltd, Orange.

Clarence Colliery Lease Extension. Environmental Impact Statement. International Environmental Consultants, Brighton-Le Sands, Sydney.

IEC 2003. *Environmental Impact Statement. Multi-commodity Sand Extraction and Kaolin Project for Supply of Construction Materials to the Sydney Region from Newnes Plateau.* International Environmental Consultants, Brighton-Le Sands, Sydney.

Leigh J, Boden R and Briggs J. 1984. *Extinct and Endangered Plants of Australia.*

Lindsey RL. 1992. *Encyclopedia of Australian Animals: Birds.* The Australian Museum, Sydney.

MacDonald D. 1984. *The Encyclopedia of Mammals.* George Allen & Unwin, London.

Marchant S and Higgins PJ. 1990. *Handbook of Australian, New Zealand and Antarctic Birds. Volume 1.* Oxford University Press, Melbourne.

Marchant S and Higgins PJ. 1993. *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2. Raptors to Lapwings.* Oxford University Press, Melbourne.

Maxwell S, Burbidge AA and Morris K. 1996. *The 1996 Action Plan for Australian Marsupials & Monotremes.* NPWS, Canberra.

NPWS. 2000. *Blue Mountains Water Skink (Eulamprus leuraensis) Draft Recovery Plan.* NSW National Parks & Wildlife Service, Hurstville.

Richards G. 2000. *Proceedings of a Workshop to Assess the Status of the Grey-headed Flying Fox in New South Wales.* Australian Bat Society. Sydney.

Robinson M. 1994. *A Field Guide to Frogs of Australia.* Australian Museum, Sydney.

Simpson K and Day N. 1999. *Field Guide to the Birds of Australia.* Sixth Edition. Penguin Books, Australia.

Strahan R. 1995. *The Mammals of Australia.* Reed Books, Chatswood.

Strahan R (*ed*). 1991. *The Australian Museum Complete Book of Australian Mammals.* Collins Angus & Robertson, Australia.

Tyler MJ. 1997. *The Action Plan for Australian Frogs.* Environment Australia, Canberra.

Tyler MJ (*ed*). 1992. *Encyclopedia of Australian Animals: Frogs.* Australian Museum, Sydney.

White AW. 2002. *Survey for the Giant Burrowing Frog Heleioporous austrailiacus. Newnes Kaolin Site.* Biosphere Ecological Consultants, Sydney.

White AW. 2004. *Survey for Habitat of the Blue Mountains Water Skink Eulamprus leuraensis at Newnes Kaolin Site.* Biosphere Ecological Consultants, Sydney.

York A, Binns D and Shields J. 1991. *Flora and Fauna Assessment in NSW State Forests: Survey Guidelines.* Version 1.1a. Forestry Commission of NSW, Sydney.

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

APPENDIX A

Supplementary Vegetation and Flora Survey (HWR 2004)

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

Flora Assessment
Sand Extraction and Kaolin Project
Newnes Junction

Sydney Construction Materials

Prepared by

Andrew Carty, Geoff Winning & John-Paul King

07 April2004
ver. 1.1

Table of Contents

1. Introduction

1.1 Scope of Report

This report presents an assessment of the potential impacts on flora from the proposed sand and kaolin extraction mine on part of the Newnes Plateau. As well as general flora issues, the report particularly addresses legislative planning requirements relating to flora. This report aims to provide descriptive information about the flora on the site and identify any threatened species, populations or ecological communities legislated under the *Threatened Species Conservation Act 1995* (TSC Act), pursuant to section 5A of the *Environmental Planning & Assessment Act 1979* (EPA Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The purpose of this report is to assist the relevant government authority with their determination of the proposal.

1.2 Previous Flora Studies

Previous flora surveys on this particular site include the Environmental Impact Statement (EIS) completed by International Environmental Consultants Pty Ltd (2003) and work completed by P & J Smith Consultants (2003) involved a flora survey of the site. Studies adjacent to the proposal area include EIS's prepared for the Clarence Colliery by Corkery and Co Pty Ltd (1994) and International Environmental Consultants (2000). Regional flora studies include mapping work completed by Benson and Keith (1990), *The natural vegetation of the Wallerawang 1: 100 000 map sheet*, which describes and coarsely maps the different vegetation communities in this area. We have generally utilised such documents in compiling background information for this report.

The key documents presenting the results of flora and fauna surveys are listed in Table 1.1. Collectively, these studies represent a comprehensive description of the flora and fauna of the Newnes Plateau.

Table 1.2. Key previous environmental studies.

Report	*Nature of Report*	*Prepared for*
International Environmental Consultants Pty Ltd (2003)	Environmental Impact Statement (EIS) for proposed sand and kaolin extraction project	Sydney Construction Materials
Corkery and Co Pty Ltd (1993)	EIS for Clarence colliery extension.	Coalex Pty Ltd
Benson and Keith (1990)	Vegetation mapping of Wallerawang 1:100 000 Map Sheet	
Smith and Smith (2003)	Objection to proposed sand and kaolin extraction project	
International Environmental Consultants Pty Ltd (2000)	EIS for Clarence colliery lease extension	Centennial Coal Company Ltd

1.3 Study Area

The proposal area for the mining operation is approximately 25.5 ha in area. The vegetation of the site has been moderately disturbed by vehicles and clearing in the past. The site has an easterly aspect and consists of moderate slopes with wide un-defined drainage lines. Adjacent to the site is the Rocla Quarry to the south, the Clarence Colliery to the north and the small village of Newnes Junction to west along with rail infrastructure. The Blue Mountains World Heritage Area occurs to the east. These surrounding uses in relation to the proposal area are shown in Figure 1.3.

1.4 Methods

The flora of the proposal area was assessed using descriptive methods. This included point surveys of areas along pre-defined transects. Recorded at each point survey was the canopy species present within 10 metres and the understorey species within 5 metres. Point surveys were conducted every 50 metres along each transect. Transects were situated to assess environmental gradients across the drainage lines (north-south) as well as along them (approx. west-east).

NOTES: 1. Base map : M 8931-3-S	HWR Ecological	**Proposal area and surrounding landuse.** Flora Assessment	
4 March 2004		Scale 1 : 7500	**Figure 1.3**

2. Description of Proposal Area

The proposal area comprises three vegetation community types. The vegetation communities recorded on site have affinities to the vegetation communities described and mapped by Benson and Keith, these are in order of abundance; Blue Mountains Sandstone Plateau Forest occurring over the majority of the site, Newnes Plateau Shrub Swamp was found in one area of the southern drainage line and Newnes Plateau Woodland situated in a small area on the west of the proposal area.

A list of plant species recorded within the proposal area is presented in Appendix 1.

3. Flora Issues

3.1 What Does "Significant" Mean?

The term significant is often used to describe species, populations and ecological communities considered to be valuable by someone. However the term is not defined in any legislation and is therefore used variously by different authors. In an attempt to clarify the usage of this term we have provided a brief discussion below of different degrees often applied to this term.

3.1.1 Significance Deriving From Legislation

Species, populations or ecological communities formally listed as threatened under NSW legislation (TSC Act) or Commonwealth legislation (EPBC Act) have significance confirmed by this listing and are referred to as being of state significance or national significance respectively. These listings are subject to a formal review process involving a technical committee and public submissions. Species, populations and ecological communities listed under legislation have express protection and particular consideration under the legislative planning framework.

Threatened species, populations or ecological communities are protected under legislation and therefore the consent authority must take into account the factors listed in section 5A of the EPA Act, often referred to as the 'eight-point test'.

3.1.2 Rare or Threatened Australian Plant List

The Rare or Threatened Australian Plants (ROTAP) list is a formal listing that is subject to a technical review and is published. However, it does not have any legislative backing, and while many ROTAP-listed species are also listed under relevant State or Commonwealth legislation, this is not necessarily the case. The ROTAP list identifies plants that are Presumed Extinct, Endangered, Vulnerable, Rare or Poorly Known at the national level. The ROTAP list categorises plants into the above conservation status categories along with other descriptive categories detailing the specie's distribution, range and reservation.

3.1.3 Informal Significance

Species, populations or ecological communities are often described in published papers or unpublished reports as having "conservation significance", "regional significance" or some other description of significance. These descriptions are the opinions of the author(s) of that paper or report and have generally not been subject to any wider review process. By implications, these informal assignments of significance do not generally carry the same weight as a formal listing, although there weighting often depends on the reputation of the author(s).

3.2 Vegetation Communities

There are three different vegetation communities occurring on site. In order of abundance these are Blue Mountains Sandstone Plateau Forest occurring over the majority of the site, Newnes Plateau Shrub Swamp was found in one area of the southern drainage line and Newnes Plateau Woodland situated in a small area on the west of the proposal area.

3.2.1 Endangered Ecological Communities

None of vegetation communities identified either on the subject site or in its immediate vicinity are presently listed as an Endangered Ecological Community under the TSC Act.

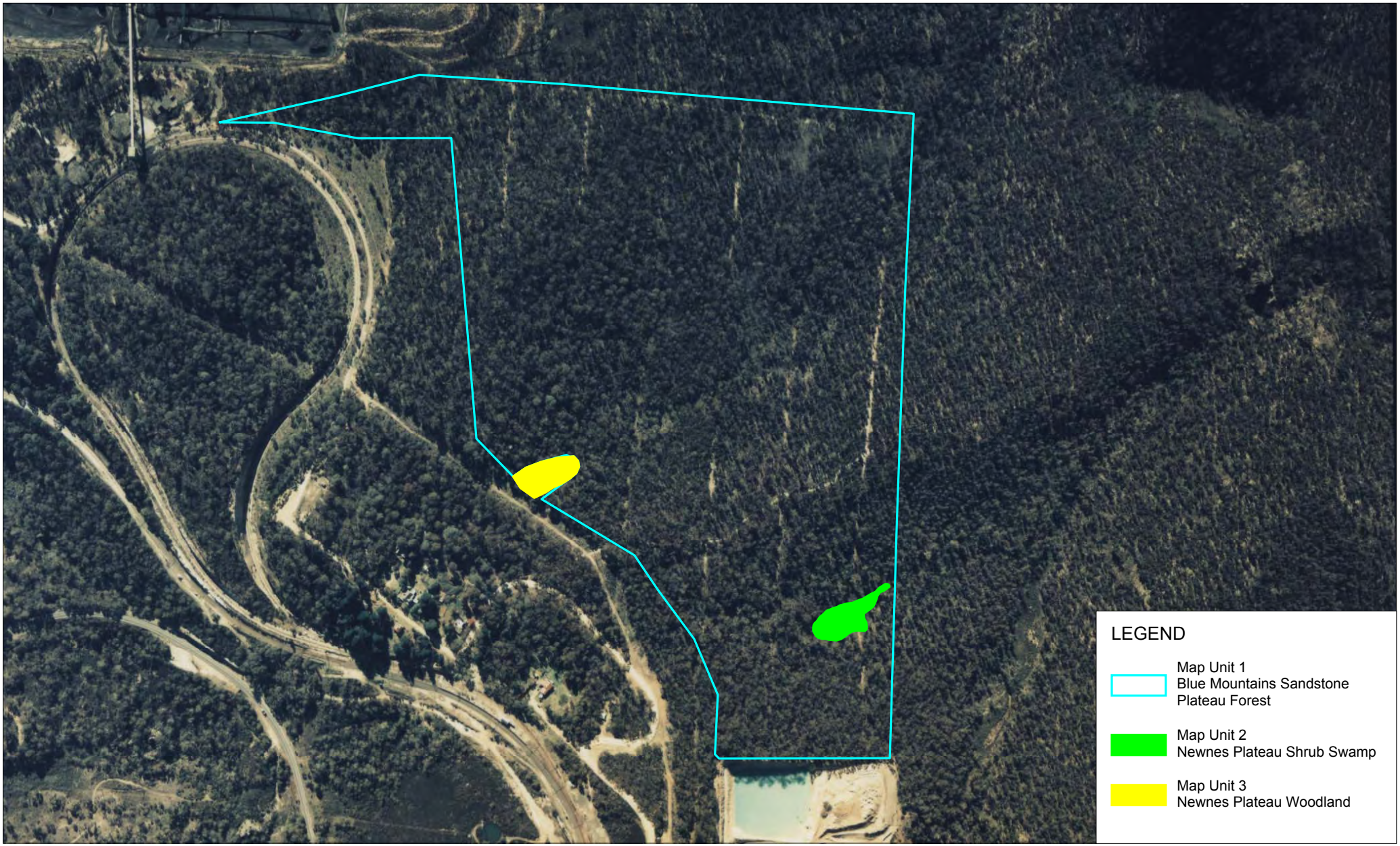
3.2.2 Other "Significant" Ecological Communities

The Newnes Plateau Shrub Swamp is an ecological community that is considered to have high conservation significance and only small patches are protected in conservation reserves (Benson & Keith, 1990). This community is defined as being restricted to the Newnes Plateau where it is apparently naturally rare, only occurring in narrow elongated patches in low-slope headwater valleys (Benson & Keith, 1990).

The Newnes Plateau Shrub Swamp community is not listed as an "Endangered Ecological Community" under the TSC Act, and at the time of this *Report*, had not been nominated for such listing. However, this vegetation community has been nominated as a "Threatened Ecological Community" and is currently under consideration under the EPBC Act (Environment Australia, 2004). Blue Mountains Swamps is the title given under the EPBC Act for an array of swamp communities, encompassing a range of different swamp types in the Blue Mountains area, including the Newnes Plateau Shrub Swamp.

One element of the importance of this ecological community is the threatened flora and fauna species for which it provides habitat, as identified by Benson & Keith (1990) and Smith & Smith (2003). Species listed under the TSC Act and the EPBC Act that have been recorded in the Newnes Plateau Shrub Swamp are *Caladenia tessellata* (an Endangered terrestrial orchid), *Boronia deanei* (a Vulnerable species) and the Endangered Blue Mountains Water Skink (*Eulamprus leuraensis*). The swamp community also provides habitat for a number of plant species of conservation significance (Benson & Keith, 1990; Smith & Smith, 2003), some of which are on the ROTAP list, but none of these species are listed under the TSC Act.

The Newnes Plateau Shrub Swamp community occurs on sandy/loamy soils that are relatively deep, high in organic matter and periodically waterlogged (Benson & Keith, 1990). The structure and floristics of the community varies from an open-scrub to a closed-heath to a sedgeland depending upon abiotic factors such as soil type and hydrology (Benson & Keith 1990). Generally the vegetation consists of low shrubs and sedges with trees usually absent (except for the fringes). Table 3.2 presents a comparison of the species identified by Benson & Keith (1990) as occurring in the Newnes Plateau Shrub Swamp and their presence or absence in the proposal area. Vegetation on the site identified as having affinities to the Newnes Plateau Shrub Swamp is mapped in Figure 3.2.



NOTES: 1. Base map : M 8931	HWR Ecological	**Vegetation communities** Flora Assessment	
17 March 2003		Scale 1 : 6500	**Figure 3.2**

Table 3.2. Plant species identified by Benson & Keith as occurring in the Newnes Plateau Shrub Swamp and their presence or absence in the two patches of moist swamp habitat on the subject site at Newnes.

Benson & Keith- Newnes Plateau Shrub Swamp	Species found in the swamps of the proposal area
Epacris paludosa	No
Epacris microphylla	Yes
Grevillea acanthifolia ssp. acanthifolia	No
Leptospermum grandifolium	Yes
Baeckea linifolia	Yes
Baeckea utilis	No
Boronia deanei	No
Lepyrodia scariosa	Yes
Empodisma minus	Yes
Lepidosperma limicola	Yes
Xyris ustulata	No
Patersonia fragilis	Yes
ALONG WATER CHANNELS	
Gleichenia dicarpa	No
Gymnoschoenus shaerocephalus	No
IN DRIER AREAS	
Hydrocotyle spp.	Yes
Viola hederacea ssp. sieberiana	Yes
Gonocarpus tetragynus	Yes
Xanthosia dissecta	
FRINGES	
Eucalyptus mannifera	Yes
Eucalyptus gregsoniana	Yes
HIGHER CLAY CONTENT	
Leptospermum polygalifolium (L. flavescens)	Yes
Leptospermum myrtifolium	No
Leptospermum continentale	Yes
Leptospermum obovatum	No
Restio australis	Yes
Juncus continuus	Yes
Lomandra longifolia	Yes

The drainage lines running through the Blue Mountains Sandstone Plateau Forest on the subject site contain patches of the species identified by Benson & Keith (1990) as occurring in the Newnes Plateau Shrub Swamp. However, these assemblages of flora species are generally swampy riparian vegetation, and not "diagnostic" for the Newnes Plateau Shrub Swamp community. Further, the

patches on the site are very small and linear with a mix of canopy and understorey species derived from the surrounding Blue Mountains Sandstone Plateau Forest. Most of the vegetation in these locations on site could not be defined as Shrub Swamps due to the lack of characteristic features of a swamp environment, including relatively flat or gently sloping areas that are constantly (or nearly so) moist, (usually) a lack of tree canopy, and a relatively uniform shrub/sedge canopy.

The drainage line in the southern part of the subject site has some affinities to the Newnes Plateau Shrub Swamp described by Benson & Keith (1990), and could be described as a drier version of that community. This analysis is based on the moderate size of the Shrub Swamp in a wide and gently-sloping gully that is relatively moist, with no tree species interspersed throughout and some of the floristics of the Newnes Plateau Shrub Swamp.

The drainage line through the centre of the subject site also has some limited affinities to the Newnes Plateau Shrub Swamp. The areas of swampy vegetation are small and patchy with trees interspersed throughout the patches of shrubland. This area is marginal between Newnes Plateau Shrub Swamp and the more usual drainage line vegetation throughout the subject site. Possible reasons for the difference between this area and the swamp area to the south includes: steeper slopes aiding better drainage allowing for trees to grow in places along the drainage line; the narrow structure of the drainage lines; and the smaller size and linear shape of the patches.

It is significant that both of these swampy areas are lacking species that are characteristic of the Newnes Plateau Shrub Swamp, particularly species identified as being "dominant" in this vegetation community, such as *Grevillia acanthifolia subsp. acanthifolia* and the sedgeland (wetter) species such as *Gymnoschoenus sphaerocephalus* and *Xyris ustulata*. Possible reasons for these species being absent are the abiotic factors including small catchment size (meaning relatively small amounts of water draining into these areas) and moderate slopes (contributing to better drainage).

An area of Newnes Plateau Shrub Swamp mapped by Benson & Keith (1990) to the west of the proposal area was investigated and found to contain the species absent from the subject site. This was much damper and flatter with free flowing water in places where the sedgeland species were found. No free running water was noted in the patches on the subject site, even after significant rain during the site survey. The small size of these swamp communities found in the subject site may also contribute to the lower floristic diversity.

Given the considerations detailed above, it is concluded in this *Report* that:

- the northern (central) drainage line on the subject site does not support vegetation that could reasonably be classified as Newnes Plateau Shrub Swamp; and
- the southern drainage line supports a small area of swamp vegetation that has some affinities with the Newnes Plateau Shrub Swamp community, but lacks many of the significant (or "diagnostic") species. For reasons of caution, this area of vegetation is to be treated as if it is Newnes Plateau Shrub Swamp.

3.3 Plant Species

A number of plant species listed on the TSC Act (1995) and EPBC Act (1999) occur in the local area, these are listed in Table 3.3.1. Other plant species on the ROTAP list occur in the area although are not covered by legislation, these species are listed in Table 3.3.2. These species have been identified as species of particular conservation significance by Benson & Keith (1990) and Smith & Smith (2003).

3.3.1 Threatened Plant Species

Threatened species that are likely to occur in the area were targeted during the survey but no threatened plant species were identified on site. These species are listed in Table 3.3.1 and were identified as occurring in the local area using a search on the NPWS website for threatened species on the Wallerawang 1:100 00 Map Sheet.

Table 3.3.1. Threatened species that occur in the area covered by the Wallerawang 1:100 000 map Sheet.

Species Name	Legal Status		Potential Habitat	Likelihood of being on Site
	TSC Act	EPBC Act		
Acacia bynoeana	E1	V	Dry forest/woodland/heath	Moderate Habitat, meandering searches on slopes and ridges
Prostanthera cryptandroides	V	V	Dry forest, rocky places	Minimal habitat, meandering searches on shallower ridges and slopes
Prostanthera cryptandroides subsp. cryptandroides	V	V	Dry forest, rocky places	Minimal habitat, meandering searches on shallower ridges and slopes
Prostanthera stricta	V	V	Forest on sandy alluvium, near water	Marginal Habitat, meandering searches in creeklines
Apatophyllum constablei	E1	E	Rocky hillsides	Minimal habitat, meandering searches on shallower ridges and slopes
Darwinia peduncularis	V		Dry forest on sandstone	Moderate Habitat, meandering searches on slopes and ridges
Eucalyptus cannonii	V	V	Woodland/shallow soil	Minimal habitat, meandering searches on shallower ridges and slopes
Boronia deanei	V	V	Heath/shrubland on swampy ground	Moderate habitat in creeklines, concentrated searches
Leionema sympetalum	V	V	Rocky outcrops in Dry Forest	Minimal habitat, meandering searches on shallower ridges and slopes
Grevillea evansiana	V	V	Dry forest/woodland sandy soil	Marginal habitat, meandering searches on slopes and ridges

Grevillea obtusiflora subsp. fecunda	E1	E	Open low scrub under dry forest in sandy loam soil	Marginal habitat, meandering searches on slopes and creeklines
Persoonia acerosa	V	V	Dry forest/heath on sandstone	Moderate habitat, meandering searches on slopes and ridges
Persoonia hindii	E1		Dry forest/woodland sandy soil	Moderate habitat, meandering searches on slopes and ridges
Persoonia marginata	V	V	Dry forest on sandstone	Moderate habitat, meandering searches on slopes and ridges
Derwentia blakelyi	V		Dry forest/woodland sandy soil	Moderate habitat, meandering searches on slopes and ridges
Haloragodendron lucasii	E1	E	Dry forest, sheltered slopes, near water	Marginal habitat, meandering searches on slopes and creeklines
Pultenaea glabra	V	V	Dry forest on sandstone	Moderate habitat, meandering searches on slopes and ridges
Pultenaea sp. 'Genowlan Point'	E1		Well drained stony soil near cliffs	Minimal habitat, meandering searches on shallower ridges and slopes

Note: Above species list was obtained using a search on the NPWS website for threatened species on the Wallerawang 1:100 00 Map Sheet.

Species that have a higher likelihood of occurring in the proposal area were searched for more intensively with targeted searches in suitable habitat. These species are detailed below.

Acacia bynoeana

This species is a small shrub to 1m high. It is endemic to central eastern NSW and occurs in an area from the Hunter district on the Central Coast south to Berrima and Mittagong in the Southern Highlands. The total population is estimated to consist of only a few hundred plants (NSW Scientific Committee, 1998). *A. bynoeana* has been recorded within several conservation reserves including the Blue Mountains NP and Agnes Banks NR (NPWS,1999) *A. bynoeana* occurs mainly in heath and dry sclerophyll forest with a typical substrate of sand and sandy clay, often with ironstone gravels and is usually very infertile and well-drained (NPWS,1999). The species seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds (from grading) and in recently burnt open patches (NPWS, 1999). This species is one of the species from Table 3.3.2 to most likely to occur in the proposal area as the vegetation structure and disturbed nature of the site are suitable, but the soil type is possibly a limiting factor. This species was not identified on site after targeted searches.

Darwinia peduncularis

This species occurs as local disjunct populations in coastal New South Wales with a couple of isolated populations in the Blue Mountains. Some populations are within conservation areas including the Wollemi National Park, Blue Mountains National Park and Berowra Valley Regional Park (NPWS, 1999). Darwinia peduncularis is a divaricate shrub that grows in dry sclerophyll forest on sandstone hillsides and ridges. Local populations are small with the total population likely to be less than 2500 or possibly less than 1500 (NPWS, 1999). Populations are vulnerable due to small population sizes and are threatened by altered fire regimes, trail bikes, inappropriate or overused walking trails and weed invasion. This species was not recorded within the proposal area after targeted surveys on slopes and ridges.

Boronia deanei

The Newnes Plateau Shrub Swamp was described by Benson & Keith (1990) and Smith & Smith (2003) as providing habitat for *Boronia deanei*. It was recorded by Corkery & Co Pty Ltd (1993) at Clarence colliery. The species is at its northern limit and has a local disjunct population (Benson & Keith, 1990) and so is vulnerable to stochastic events. This species was not identified in the proposal area.

Persoonia acerosa

This species is an erect to spreading shrub with glabrous to sparsely hairy young branchlets. It occurs in dry open forest, woodland and heath on sandy soils. Its range extends from the central Blue Mountains south to Hill Top and is represented in the Blue Mountains National Park (Weston, 1995). It was not recorded during the survey after targeted searches on slopes and ridges.

Persoonia hindii

This species is restricted to the Newnes Plateau where it occurs in dry sclerophyll forest and woodlands dominated by a variety of Eucalypt species on sandstone soils. It is known from only 9 locations in the Newnes State Forest, with each location occupying only a small area (<1ha) and only 1 to a few individuals occurs at each site (NPWS, 2000). Its small numbers and area of distribution make the species vulnerable to stochastic events. It's threatened by activities associated with forest management, frequent fire and sand mining (NPWS, 2000). This species was not recorded in the proposal area.

Persoonia marginata

This species is a spreading to decumbent shrub with moderately to densely hairy young branchlets. It is restricted to dry sclerophyll forest on sandstone in the Capertee district (Weston, 1995). The species is not known to occur in any conservation reserves. This species was not located in the proposal area after targeted searches.

Derwentia blakelyi

This species is a small glabrous and glaucous shrub or woody herb to 50 cm high. It is restricted to the western Blue Mountains, near Clarence, near Mt Horrible, Nullo Mountain and the Coricudgy Range (NPWS, 2003). It grows in eucalypt forest often in moist areas. The species is currently known from less than 20 locations none of which is in a conservation reserve. Known locations all have small population sizes. Threats to the species include loss of habitat by clearing and an inappropriate fire regime (NPWS, 2003). The risk of local extinction is high because of the small population sizes. This species was not located on the site after targeted searches.

Pultenaea glabra

This species is an erect, glabrous shrub with small scattered populations. It occurs only in the Blue Mountains between Wentworth falls and Katoomba (Fairley & Moore, 1995). Its patchy distribution and relatively low population numbers (Fairley & Moore, 1995) makes it vulnerable to stochastic events. It prefers open forest and scrub on protected slopes. This species was not located on the proposal site after targeted searches.

Caladenia tessellata

The Newnes Plateau Shrub Swamp was identified by Smith and Smith (2003) as providing habitat for *Caladenia tessellata*. It is known from two disjunct populations at Wyong and near Braidwood which could both be considered too far away from Newnes Junction for this threatened species to be relevant to the site (NPWS, 2003). This species was not listed from a search of threatened species of the Wallerawang 1:100 000 Map Sheet on the NPWS website. This species was not recorded in the proposal area.

If any of the above threatened species were previously present on the subject site there are a number of factors that may have contributed to the extinction or decline. These include disturbance events on the site such as past clearing, disturbance from vehicle use along the many tracks dissecting the proposal area and an altered fire regime. If there are any threatened species on site the population size would be relatively low or may only persist in the seed bank.

3.3.2 Other "Significant" Plant Species

There are a number of plant species regarded as having conservation significance that occur on site and are known to occur in the local area. This species have been identified having conservation significance by Benson & Keith (1990) and Smith & Smith (2003). These species are listed in Table 3.3.2. and a further assessment is given for species identified in the proposal area.

Table 3.3.2. Species regarded as having particular conservation significance but not covered by legislation

Species	Significance	ROTAP status	Records on site
Isopogon prostratus	Local disjunct pop./ Nth limit		IEC
Eucalyptus laophila	Local endemic	3RC-t	HWR, S&S
Hakea pachyphylla	Restricted to blue mountains		HWR, S&S
Celmisia longifolia	Local disjunct pop.		No records
Acacia asparagoides	Local endemic	2R	No records

Acacia kybeanensis	Local disjunct pop./ Nth limit		No records
Dillwynia stipulifera	Local disjunct pop./ Nth limit	3RCi	No records
Pultenaea incurvata	Local endemic	2RCt	No records
Eucalyptus gregsoniana	Local disjunct pop.	3RCa	HWR, S&S
Banksia conferta var. penicillata	Local endemic variety	3RC	HWR
Eriostemon obovalis	Local endemic	3RCa	No records

Note: Above species identified as having conservation significance by Benson & Keith and Smith & Smith.

Eucalyptus laophila

This species is a mallee only recently described (Smith & Smith, 2003). It has limited distribution and is a local endemic (Benson and Keith, 1990). It has a scattered distribution throughout the site particularly on the slopes and ridges with shallower soils. These plants should be located on site and incorporated into a seed collection program for rehabilitation projects on and off the proposal area.

Hakea pachyphylla

This species was included in *Hakea propinqua* in the past and has only recently been described as a separate species (Smith & Smith, 2003). It has a scattered distribution throughout the proposal site in most of the habitat types. These plants should be located and mapped on site and incorporated into a seed collection program for rehabilitation projects on and off the proposal area.

Eucalyptus gregsoniana

This species has sporadic and scattered distribution (Eucalink, 2003) making it a significant conservation species. It has a scattered distribution along the swamp edges particularly around the fringes of Swamp 1 (southern end). These plants should be located and mapped on site and incorporated into a seed collection program for rehabilitation projects on and off the proposal area.

Banksia conferta var. penicillata

This species is a local endemic variety of *Banksia conferta var. conferta* which nearest occurrence is located 600km away (Fairley & Moore, 1995). This species was located on the higher ridges and slopes at the north-western end of the proposal area. These plants should be located and mapped on site and incorporated into a seed collection program for rehabilitation projects.

4. Potential Impacts and Mitigation

4.1 Threatened and Rare Plants

The EIS for the project states that approximately 25 ha of vegetation will be cleared for the site. It is recommended to mitigate impacts on biodiversity that a Seed Collection Management Plan be developed for rehabilitation in the proposal area and for other local rehabilitation projects as well as for any landscaping required for the development.

To mitigate the possible loss of threatened plants that may occur on the site (although no records occur) it is recommended that additional concentrated searches be conducted. If any threatened species are found they should be mapped and incorporated into the Seed Collection Management Plan and rehabilitated. At each stage of the six stage development, any located threatened plants should be transplanted and rehabilitated at a suitable site, such as at the Botanic Gardens or a rehabilitation site. Detailed searches should also be conducted for any other species identified as being of regional conservation significance, and locations mapped and incorporated into the Seed Collection Management Plan. The site should be totally rehabilitated at the end of the mining phase with local plant species.

4.2 Newnes Plateau Shrub Swamp

The proposed mining operations will impose impacts on the two patches swampy riparian located on site. Vegetation along the central drainage line cannot be avoided by the mining operations, and will be cleared. However, this vegetation is not considered to constitute Newnes Plateau Shrub Swamp given its size, floristics and vegetation structure.

Conversely, the swampy riparian vegetation in the southeastern part of the subject site has some greater affinities with the Newnes Plateau Shrub Swamp community, and is of a larger size and greater floristic structural relevance. Consequently, even if not satisfying the criteria for the Newnes Plateau Shrub Swamp community, this patch of vegetation is recommended for retention, and is to be provided with a vegetation buffer of 50 metres. The hydrological features supporting this area of vegetation should also be maintained so that the drainage conditions supporting the vegetation are not significantly altered.

Monitoring of the floristics, hydrology and general health of the community should be conducted over the life-phase of the mine to determine the success of this conservation effort.

4.3 Edge Effects

Developments adjoining natural areas have the potential to contribute to a numbers of impacts along the edge of the natural area adjoining the development site. These include altered hydrology, increased nutrients and sediments, soil disturbance and increased light that in turn can aid weed invasion, alter the natural floristics, alter fauna habitat and cause nutrification of wetlands and streams. These impacts are collectively referred to as edge effects and typically result in a

disturbance ecotone between the development and the natural area. The nature of the impacts and the width of the disturbance ecotone are influenced by the type of development, the character of the natural remnant, and management procedures implemented to mitigate the impacts.

It is recommended that a minimum buffer zone of 50 metres be implemented along all boundaries adjacent to the World Heritage Area. To ensure that the buffer zones are effective use of best-practice management of stormwater, control of construction impacts, use of local native plant species in all landscaping, and management of site activities can mitigate this potential problem.

4.4 Erosion, Sedimentation & Nutrient Transport

Removal of vegetation exposes the soils to potential erosion, resulting in siltation in downstream gullies and waterbodies. Sediments often transport nutrients which can result in increased soil nutrient levels in downstream environments, often favouring weed invasion and altering the natural vegetation community. This would be a concern mainly during the construction phase and can be managed using best practice erosion and sedimentation control methods and clearing the minimal amount of vegetation required for each stage of the development.

5. Section 5A Assessment

5.1 Interpretation of Section 5A of the EPA Act

In determining whether there is likely to be a significant effect on threatened species, populations, or ecological communities the consent authority must take into account the factors listed in section 5A of the EPA Act, often referred to as the 'eight-point test'.

While an ecological assessment provides the data, and an interpretation of these data, on which the decision is based, the actual decision as to whether a proposed development will have "a significant effect on threatened species", and therefore whether a species impact statement is required, is a planning decision not a scientific one.

The assessment presented in this report of the potential effects of the proposal is intended as advice to the client and the consent authority on which they can base their decisions. The opinions expressed as to the significance of any predicted effects are our interpretation of the available data.

The following discussion presents a detailed interpretation of the eight factors under s. 5A. The actual assessment of impact of the proposal on each species using these factors is presented in Section 5.2 below.

(a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

This is perhaps the most important factor for consideration. It seeks to ensure that local populations of threatened species are retained at a viable level, and that there is sufficient suitable habitat to support such populations. This conservation strategy is strongly supported by biodiversity principles which require conservation of intraspecific diversity as well as conservation of species. This is generally achieved by conserving a species across its whole range.

The phrasing of the factor raises two important questions in relation to each threatened species which is known to occur on a site which is the subject of a development proposal:

(i) What should be considered to be the geographical limit of the "local population"?

The term "local" as a measure of geographical extent is not defined in ecological literature, and could have a different meaning in different contexts, and would probably be interpreted differently by different people. The problem of addressing the term "local population" is probably best approached through a consideration of the meaning of the word "population" rather than "local".

A general definition of "population" would be a group of interbreeding organisms of the same kind, usually species, occupying a particular space. Such a definition was adopted by the TSC

Act, which defined "population" as meaning "a group of organisms, all of the same species, occupying a particular area". Ecologically, this definition is generally modified to mean "a group of organisms of one species occupying a defined area and reproductively isolated to some degree from other similar groups". Based on this definition, the "local population" of a species would comprise the group of interacting individuals of that species that occur in and around the site under study, but which is reproductively separated to some degree from other groups of that species.

Thus a "local population" must exhibit a capacity for ready exchange of genetic material between individuals within the population (i.e. through breeding for animals and pollination for plants), but genetic exchange with individuals outside of the population is substantially limited by a geographical barrier (including anthropogenic barriers). The geographical extent of the local population will often vary for different species, depending on their mobility, in the case of animals, or pollination and/or seed dispersal mechanisms, in the case of plants.

Where detailed data on the true extent of the local population and/or on movement of individuals or genetic material are not available, a precautionary approach is to consider the population present in the study area to be the local population.[1]

For a population to be "viable" it must be capable of maintaining the average number of individuals in the population over the longer term. For smaller populations it is also important that there be a capacity to exchange genetic material with other populations (to prevent inbreeding) through occasional movement of individuals, in the case of animals, or of pollen or seed, in the case of plants. NSW National Parks & Wildlife Service advises a precautionary approach whereby a local population should be considered to be viable unless the contrary can be conclusively demonstrated.[2]

(ii) Given that a development would have an effect on the local population of a species, how do we determine whether this effect would be likely to place the local population at risk of extinction ?

This question relates to the viability of remnant populations. If a development removes or alters a large proportion of the habitat of a species, the population of that species may drop to a level which is not sustainable in the longer term. This is the main question that needs to be addressed in relation to most developments affecting threatened species. It is almost inevitable that development of a site supporting a threatened species would result in the ultimate loss of some individuals of that species. The issue is whether the loss of these individuals would affect the long term viability of the local population of that species, thereby placing it at risk of extinction.

This raises ecological issues such as minimum viable population and minimum area, which have proven difficult to apply in real situations. There are population viability analysis models that

[1] NSW National Parks & Wildlife Service, Threatened Species Management Information Circular No. 2, November 1996.
[2] ibid

can assist in making predictions of the effects of different land management options, although these are often difficult to apply because of the absence of necessary data to calibrate the models for a particular species. While there is clear scope for the application of these models in the near future, at present decisions are generally based on relatively subjective judgements which, in turn, are typically based on the proportion of the known population or habitat to be affected.

We consider this to be the critical factor in the section 5A assessment and, therefore, our assessment of likely effects on each target species focuses on this factor.

(b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

This factor applies a similar test as in factor (a) to endangered populations. No endangered populations are to be affected by the proposal.

(c) *in relation to the regional distribution of the habitat of a threatened species, population of ecological community, whether a significant area of known habitat is to be modified or removed.*

This factor takes a broader, regional view, requiring consideration of the regional availability of habitat of the species. The subject site falls within the NSW North Coast region. In relation to threatened species, this factor in effect somewhat duplicates the consideration of the first factor in that any activity which would modify or remove a significant area of regional habitat of a species would also affect the survival of the local population of that species.

(d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.*

Isolation of habitats can lead to a decline in otherwise viable populations of plant and animal species as isolation can prevent exchange of genetic material which could lead to inbreeding. However, geographical isolation is not necessarily always negative. For example, if isolated populations are large enough, genetic drift in such populations can lead to the eventual evolution of new subspecies or species.

Isolation is relative to the species under consideration. For example, highly mobile species such as bats and many bird species can fly over large areas of hostile habitat (e.g. residential development) to reach isolated patches of suitable habitat. Indeed, some of these species would make use of landscape plantings as movement corridors through urban areas. However, strictly terrestrial animals, especially smaller ones such as lizards, can have their movement restricted just by a relatively small distance of hostile habitat. As many plant species rely on animals for transport of propagules (seeds, etc.) geographical isolation which limits fauna movement can also affect the long term viability of plant populations.
The primary considerations are, clearly, the movement capabilities of any threatened species likely to be affected by the development, and the local of the habitat to be affected relative to other habitats.

(e) *whether critical habitat will be affected.*

There is a capacity for critical habitats to be gazetted under the Threatened Species Conservation Act 1995. No such habitats have yet been gazetted.

(f) *whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or similar protected areas) in the region.*

In this factor, "conservation reserves (or similar protected areas)" would be most likely intended to refer to land administered by NSW National Parks & Wildlife Service, as this is the only agency which specifically manages its land for conservation purposes. The subject site falls within the NSW Blue Mountains region. The state of our knowledge of the distribution of many threatened species is poor, there are often inadequate references to determine the adequacy of conservation of many species. However, it is probably reasonable to conclude that most threatened species are not adequately reserved.

(g) *whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.*

This factor is somewhat vague in its intention. A "threatening process" is defined in the TSC Act as "a process that threatens, or may have the capability to threaten the survival or evolutionary development of species, populations or ecological communities". The TSC Act also makes provision for the specification of 'key threatening processes' in Schedule 3 of the TSC Act. It is not clear whether the use of the word "recognised" in this factor is intended to refer to specified key threatening processes, or whether it refers to general recognition that a proposed development is of a class which has the capability to threaten the survival of species. The former is generally assumed.

(h) *whether any threatened species, population of ecological community is at the limit of its known distribution.*

Although somewhat debatable, the occurrence of a species at or close to the limit of its known distribution is often considered to confer some conservation significance on that area. This information is readily available in the scientific literature.

5.2 Section 5A Assessment for the Proposal

The development does not require a Section 5A Assessment (Eight Part Test) under the EPA Act due to there being no threatened flora species, populations or ecological communities listed under the TSC Act and/or the EPBC Act located on site the. The threatened species known to occur in the local area have been assessed in Section 3 of this report and mitigation measures for species likely to be in the proposal area are detailed in section 4.

6. Conclusion

The development of the proposed Sand and Kaolin Extraction Project at Newnes Junction is unlikely to have a significant environmental impact due compliance with the following legislated matters;

- no significant effects on threatened species pursuant to Section 5A of the *Environmental Planning & Assessment Act 1979;*
- no endangered, threatened or venerable species, ecological communities or populations listed under the *Threatened Species Conservation Act 1995* or the *Environment Protection & Biodiversity Conservation Act 1999* will be significantly impacted*;*
- no potential effects on matters of Commonwealth significance pursuant to the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* and therefore does not need to be referred to the Environment Minister for consideration.

These conclusions are based on the assumption that the following recommendations would be adopted:

- a Seed Collection Management Plan is developed and additional searches for threatened and regionally significant species is conducted by an experienced botanist with the aim of rehabilitation;
- the swamp towards the south is retained with a 50 metre vegetation buffer zone and the hydrology regime is not significantly altered;
- an absolute minimum buffer zone of 50 metres be implemented along all borders adjoining the Blue Mountains World Heritage Area;
- stormwater from the development site should be managed so there is no increase in volume entering any part of the surrounding bushland;
- best practice erosion and sedimentation control methods should be adopted and enforced during construction;
- the construction site should be managed so there is no accidental incursions into buffer zones and areas not part of the proposal;
- any landscaping to comprise of local native plants from the Newnes Plateau.

(see section 4 for more information concerning reasons for recommendations)

7. References

Benson, D.H. & Keith, D.A. (National Herbarium of New South Wales, Royal Botanic Gardens, Sydney, Australia 2000) (1990). The natural vegetation of the Wallerawang 1:100 000 map sheet. *Cunninghamia 2(2): 305-335.*

Corkery, R.W. & Co. Pty Ltd. (1993). *Environmental Impact Statement for the Proposed Northern Extension of Underground Coal Mining at Clarence Colliery.* Prepared for Coalex Pty Ltd. R.W. Corkery & Co Pty Ltd, Orange.\

Fairley, A. & Moore, P. (1995). *Native Plants of the Sydney District*. Kangaroo Press Pty Ltd, Sydney.

Harden, G.J (ed.) (2000). *Flora of New South Wales*. Volume 1. Revised Edition. Royal Botanic Gardens/University of NSW Press, Sydney

Harden, G.J (ed.) (2002). *Flora of New South Wales*. Volume 2. Revised Edition. Royal Botanic Gardens/University of NSW Press, Sydney

Harden, G.J (ed.) (1992). *Flora of New South Wales*. Volume 3. Royal Botanic Gardens. Sydney

Harden, G.J (ed.) (1993). *Flora of New South Wales*. Volume 4. Revised Edition. Royal Botanic Gardens. Sydney

International Environmental Consultants Pty Ltd. (2003). *Environmental Impact Statement Multi-commodity Sand Extraction and Kaolin Project for Supply of Construction Materials to the Sydney Region from Newnes Plateau.* Prepared for Sydney Construction Materials. International Environmental Consultants Pty Ltd. Brighton-Le Sands.

NSW National Parks and Wildlife Service (2003). *Caladenia tessellata (a terrestrial orchid) – Endangered Species Listing - NSW Scientific Committee-final determination*. NSW National Parks and Wildlife Service

NSW National Parks and Wildlife Service (2000). *Persoonia hindii (a shrub) Endangered Species Listing - NSW Scientific Committee-final determination*. NSW National Parks and Wildlife Service

NSW National Parks and Wildlife Service (2003). *Boronia deanei - Vulnerable Species Listing.* NSW National Parks and Wildlife Service

NSW National Parks and Wildlife Service (1999). *Threatened Species Information - Acacia bynoeana.* NSW National Parks and Wildlife Service

NSW National Parks and Wildlife Service (2003). *Derwentia blakelyi - Vulnerable Species Listing.* NSW National Parks and Wildlife Service

NSW National Parks and Wildlife Service (1999). *Threatened Species Information – Haloragodendron lucasii.* NSW National Parks and Wildlife Service

Websites

Australian Government, Department of the Environment and Heritage. (2004)
Website: http://www.deh.gov.au/biodiversity/threatened/communities/considered/index.html

New South Wales Flora Online, Eucalink (2004)
Website: http://plantnet.rbgsyd.nsw.gov.au/PlantNet/Euc/species.html

Weston, P.H. (1995) New South Wales Flora Online.
Website: http://plantnet.rbgsyd.gov.au/PlantNet/NSWflora/srch.html

Appendix 1

Flora List

DIVISION TRACHEOPHYTA		Vascular Plants
Subdivision Pteridophytina		Seedless Vascular Plants
CLASS LYCOPSIDA		Club Mosses
Order Lycopodiales		Clubmosses
LYCOPODIACEAE	*Lycopodium deuterodensum*	Bushy Clubmoss
CLASS FILICOPSIDA		Ferns
Order Gleicheniales		
GLEICHENIACEAE		
	Gleichenia dicarpa	Pouched Coral-fern
Order Dennstaedtiales		
DENNSTAEDTIACEAE		
	Calochlaena dubia	False Bracken
	Pteridium esculentum	Bracken
LINDSAEACEAE		
	Lindsaea linearis	Screw Fern
Order Blechnales		
BLECHNACEAE		
	Blechnum cartilagineum	Gristle Fern
	Blechnum nudum	Fishbone Water-fern
Subdivision Spermatophytina		Seed Plants
CLASS MAGNOLIOPSIDA		Flowering Plants
SUBCLASS MAGNOLIIDAE		Dicotyledons
Order Laurales		
LAURACEAE		
	Cassytha melantha	Devils Twine
Order Ranunculales		
RANUNCULACEAE		
	Clematis aristata	Toothed Clematis
Order Dilleniales		
DILLENIACEAE		
	Hibbertia obtusifolia s.str.	Blunt-leaf Guinea-flower
Order Rhamnales		
RHAMNACEAE		
	Pomaderris andromedifolia	
Order Euphorbiales		
EUPHORBIACEAE	*Amperea xiphoclada*	Broom Spurge
	Poranthera microphylla	Small Poranthera
Order Violales		
VIOLACEAE		
	Hybanthus monopetalus	Slender Violet-bush
	Viola hederacea	Ivy-leaf Violet
Order Theales		
DROSERACEAE		
	Drosera sphathulata	Common Sundew
Order Casuarinales		
CASUARINACEAE		
	Allocasuarina littoralis	Black She-oak
Order Rosales		
CUNONIACEAE		
	Callicoma serratifolia	Black Wattle
MALACEAE		

	Cotoneaster glaucophyllus	Cotoneaster	i
Order Proteales			
PROTEACEAE			
	Banksia conferta var.penicillata		
	Banksia cunninghamia		
	Banksia marginata	Silver Banksia	
	Banksia oblongifolia	Spoon-leaf Banksia	
	Banksia serrata	Saw Banksia	
	Banksia spinulosa var. spinulosa	Hairpin Banksia	
	Grevillea laurifolia	Laurel Grevillea	
	Hakea laevipes ssp. laevipes		
	Hakea pachyphylla		
	Isopogon anemonifolius	Broad-leaf Drumsticks	
	Lomatia silaifolia	Crinkle Bush	
	Persoonia chamaepitys	Prostrate Geebung	
	Persoonia laurina subsp. *laurina*	Laurel-leaf Geebung	
	Persoonia levis	Broad-leaf Geebung	
	Persoonia myrtilloides	Myrtle Geebung	
	Petrophile pulchella	Conesticks	
	Telopea speciosissima	Waratah	
Order Myrtales			
MYRTACEAE			
	Eucalyptus blaxlandii	Blaxland's Stringybark	
	Eucalyptus laophila		
	Eucalyptus mannifera	Brittle Gum	
	Eucalyptus piperita	Sydney Peppermint	
	Eucalyptus radiata ssp. Radiata	Narrow-leaved Peppermint	
	Eucalyptus sclerophylla	Hard-leaved Scribbly Gum	
	Eucalyptus sieberi	Silvertop Ash	
	Eucalyptus sparsifolia	Narrow-leaved Stringbark	
	Baeckea linifolia	Swamp Baeckea	
	Leptospermum arachnoides	Spider Teatree	
	Leptospermum continentale	Prickly Tea-tree	
	Leptospermum grandifolium	Wooly Tea-tre	
	Leptospermum juniperinum	Prickly Teatree	
	Leptospermum polygalifolium	Yellow Tea-tree	
	Leptospermum sphaerocarpum	Round-fruited Tea-tree	
	Leptospermum trinervium (narrow leaf form)	Flaky-bark Tea-tree	
	Leptospermum trinervium (broad leaf form)	Flaky-bark Tea-tree	
Order Haloragales			
HALORAGACEAE			
	Gonocarpus tetragynus	Poverty Raspwort	
	Gonocarpus teucroides	Raspwort	
Order Rutales			
RUTACEAE			
	Boronia microphylla	Small-leaved Boronia	
Order Fabales			
FABACEAE			
FABOIDEAE			
	Bossiaea heterophylla	Variable Bossiaea	
	Davesia latifolia	Broad-leaf Bitter Pea	
	Daviesia ulicifolia	Gorse Bitter-pea	
	Gompholobium latifolium	Broad-leaf Wedge-pea	
	Hovea ? Heterophylla		
	Mirbelia platyloboides		

	Phyllota squarrosa	Dense Phyllota	
	Pultenaea scabra	Rough Bush-pea	
MIMOSOIDEAE			
	Acacia falcata	Sickle Wattle	
	Acacia implexa	Hickory	
	Acacia longifolia	Sydney Golden Wattle	
	Acacia obtusifolia		
	Acacia terminalis	Sunshine Wattle	
	Acacia ulicifolia	Prickly Moses	
Order Santalales			
SANTALACEAE			
	Choretum pauciflorum	Dwarf Sourbush	
	Leptomeria acida	Native Current	
	Omphacomeria acerba	Leafless Sour Bush	
Order Pittosporales			
PITTOSPORACEAE	*Billardiera scandens*	Apple-berry	
	Rhytidosporum procumbens	Marianthus	
Order Araliales			
ARALIACEAE			
	Polyscias sambucifolia	Elderberry Panax	
APIACEAE			
	Hydrocotyle peduncularis	Hairy Pennywort	
	Platysace lanceolata	Native Parsnip	
	Platysace linearifolia	Narrow-leaf Platysace	
	Xanthosia pilosa	Hairy Xanthosia	
Order Asterales			
ASTERACEAE			
	Arrhenechthites mixta	Purple Fireweed	
	Cassinia aculeata	Dollybush	
	Helichrysum adenophorum var. waddelliae	Waddel Everlasting	
	Helichrysum scorpioides		
	Hypochoeris radicata	Flatweed	i
Order Ericales			
EPACRIDACEAE			
	Brachyloma daphnoides	Daphne Heath	
	Epacris microphylla	Small-leaf Heath	
	Epacris pulchella	Coral Heath	
	Leucopogon lanceolatus	Lance-leaf Beard-heath	
	Monotoca scoparia	Prickly Broom-heath	
Order Goodeniales			
GOODENIACEAE			
	Dampieria stricta	Blue Dampieria	
	Goodenia bellidifolia ssp. Bellidifolia	Daisy-leaved Goodenia	
Order Gentianales			
LOGANIACEAE			
	Mitrasacme polymorpha	Mitre Weed	
RUBIACEAE			
	Galium binifolium	Bedstraws	
	Galium propinquum	Maori Bedstraw	
	Pomax umbellata	Pomax	
SCROPHULARIACEAE			
	Veronica plebeia		
SUBCLASS LILIIDAE		Monocotyledons	
Order Asparagales			
LOMANDRACEAE			

	Lomandra glauca subsp. *glauca*	Glaucous Mat-rush	
	Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush	
	Lomandra longifolia subsp. *longifolia*	Spiny Mat-rush	
	Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush	
XANTHORRHOEACEAE			
	Xanthorrhoeaea media	Sydney Grass-tree	
	Xanthorrhoea resinosa	Sydney Swamp Grass-tree	
PHORMIACEAE	*Dianella caerulea* var. caerulea	Rough Flax Lily	
	Dianella revoluta	Mauve Flax Lily	
Order Liliales			
IRIDACEAE			i
	Patersonia fragilis	Glabrous Purple-flag	
	Patersonia glabrata	Cauline-leaf Purple-flag	
Order Orchidales			
ORCHIDACEAE			
	Orthoceras strictum	Horned Orchid	
Order Haemodorales			
HAEMODORACEAE	*Haemodorum planifolium*	Bloodroot	
XYRIDACEAE			
	Xyris gracilis subsp. *gracilis*	Slender Yellow-eye	
Order Juncales			
JUNCACEAE			
	Juncus continuus	Sand Rush	
Order Cyperales			
CYPERACEAE			
	Caustis flexuosa	Curved Caustis	
	Gahnia filifolia		
	Gahnia microstachya	Slender Saw-sedge	
	Gahnia sieberiana	Red-fruited Saw-sedge	
	Lepidosperma laterale	Variable Sword-sedge	
	Lepidosperma limicola	Razor Sword-sedge	
	Lepidiosperma tortuosum		
	Schoenus villosus	Hairy Bog-rush	
Order Restionales			
RESTIONACEAE			
	Empodisma minus	Spreading Rope-rush	
	Lepyrodia muellerii		
	Lepyrodia scariosa	Chaffy Scale-rush	
	Restio australis		
Order Poales			
POACEAE			
	Austrostipa pubescens	Tall Spear Grass	
	Austrostipa rudis		
	Dichelachne inaequiglumis		
	Entolasia stricta	Wiry Panic	
	Joycea pallida	Red-anthered Wallaby Grass	
	Microlaena stipoides var. *stipoides*	Weeping Grass	
	Poa labillardieri	Tussock Grass	
	Poa sieberana		

ABBREVIATIONS:
i = introduced (i.e. not indigenous to Australia)
n = native Australian species not considered to be indigenous to the site
c = cultivated (i.e. planted on the site)
t = threatened

spp. = several species of the one genus (sometimes occurring as a hybrid swarm)
sp. = unidentified
species[2]
sp. aff. = unidentified species with characteristics similar to the indicated species or genus[2]
? = unconfirmed species[2]
var. = variety
subsp. = subspecies
cv. = cultivar (i.e. a anthropogenic form of the species)
agg. = an aggregate of several yet to be defined species

NOTES:
1. A sample flora assemblage obtained from a short term survey, such as the present one, cannot be considered to be comprehensive, but rather indicative of the actual flora assemblage. It can take many years of flora surveys to record all of the plant species occurring within any area, especially species that are only apparent in some seasons, such as orchids.
2. Not all species can be accurately identified in a 'snapshot' survey due to absence of flowering or fruiting material, etc.

OCCURRENCE
CODES:
w =

For simplicity, author citations for scientific names are not given, these follow:
Hill & Johnson (1995) for *Corymbia* (Myrtaceae)
Hill (1997) for *Angophora inopina* (Myrtaceae)
Linder & Verboon (1996) and Linder (1997) for *Danthonia* sens. lat. (Poaceae)
Briggs & Johnson (1998) for *Baloskion* and *Sporadanthus* (Restionaceae)
Harden (1990-93) for all other species

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

APPENDIX B

Supplementary Survey for the Blue Mountains Water Skink (Biosphere Consutlants (2004)

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

Survey for Habitat of the Blue Mountains Water Skink *Eulamprus leuraensis* At Newnes Kaolin Site.

Introduction

The Blue Mountains Water Skink *Eulamprus leuraensis* is a poorly known species. The species was described in 1984 based on a few specimens known from the upper Blue Mountains. In the mid-1990's further lizards were found on the Newnes Plateau and since that time there have been more recorded sightings of the lizards on the southern portion of the plateau (White 2002a). In 2003, Blue Mountains Water skinks were found at Clarence (White 2003), less than 2 kilometres from the Newness Kaolin Site. This lizard species is listed under Schedule 1 Part 1 of *the Threatened Species Conservation Act 1995* and is considered to be "endangered".

In March 2004, Biosphere Environmental Consultants Pty Ltd were engaged by Newnes Kaolin Pty Ltd to undertake a habitat assessment for the Blue Mountains Water Skink. In addition, the survey was to also assess the presence of Newnes Plateau Shrub Swamp (Benson and Keith 1990) on the site.

Study Site

The Project Site is approximately 32 Ha and lies immediately north-east of the township of Newnes Junction (Figure 1). The northern boundary of the site is 500 metres long while the eastern boundary is 850 metres long. The site occupies part of the upper western slope of Wollangambe River valley (the river lies just over 1 kilometer to the east). A thin sand layer lies over a heavily decomposing sandstone layer. In a few places the underlying sandstone is visible but there are no escarpment or obvious outcrops on the site.

The site is almost completely wooded. Silver-top Ash *Eucalyptus sieberi* is the dominant tree type present. Ash forest covers over 90% of the site, only the northern portion of the site is dominated by Scribbly Gum *E. rossii*. There is a well-developed shrub layer containing a mixture of species, most notably Waratah, Drumsticks, Geebungs and Wattles. Smaller shrubs contain a high proportion of epacrids.

Two ephemeral watercourses drain the site. The northern water course (Figure 1) has two primary feeder channels that unite on site and flow out through the north-eastern corner of the site. The southern watercourse originates off-site (near Newnes Junction) and passes eastwards towards the Wollangambe River. Both watercourses remain ephemeral until they reach the Wollangambe River. At the time of the survey, neither watercourse was flowing but both contained wet seepage areas; for the northern water course a wet area existed at the 990 m contour while a more diffuse wet soil area existed at the 1020 m contour for the southern watercourse.

The wet area on the northern watercourse consisted of a narrow seepage area (located at 244950; 6293320). The shrub and tree layer give way to Saw Sedges *Ghania radula*, Ferns *Blechnum sp*. , and Black Wattle *Callicoma serratifolium.* Fringing the area is an encircling zone of Parramatta Green Wattle *Acacia parramattensis*. Small pools of water had formed in vehicle tyre ruts across this area. This degree of ground moisture was similar to that observed in 2002 (White 2002b).

The wet area on the southern watercourse consisted of abroad area dominated by the Paperbark Tea-tree *Leptospermum trinervium*. Saw sedges and other sedges such as Scale Sedge *Lepyroidia gracilis* and Cord Rush *Restio complanatus* form the ground cover between the Tea-trees. No pools of water were present in this area but the ground was soft and sodden underfoot in places.

There are no buildings or artificial structures on the site. A well-formed dirt track crosses the site from west to east ("Ridge Track"). The site contains a series of informal tracks running from north to south along the longest axis of the site. These tracks are 100 metres apart and were created for the survey and drilling teams.

Methods

Blue Mountains Water Skink Habitat: The site was traversed on foot on the day of the 17th of March 2004. Habitat for the skink is confined to upland watercourses and particularly hanging swamp where there are open water areas. Areas that were deemed to be Blue Mountains water Skink habitat were identified using the criteria listed in the Blue Mountains Water Skink Recovery Plan (NPWS 2003). Most of the habitat for these animals is confined to Blue Mountains Sedge Swamp or Newnes Plateau Shrub Swamps. Blue Mountains Sedge Swamp does not occur on or near the study site whereas Newnes Plateau Shrub Swamp is known from within the general area.

In general, these habitats consist of dense shrub thickets underlain by sedges. Characteristic plant species include Button Grass *Gymnoschoenus sphaerocephalus*, Narrow-leaved Baeckae *Baeckea linifolia*, Dagger Hakea *Hakea teretifolia*, *Grevillea acanthifolia*, *Tetrarrhena turfosa*, *Xyris ustulate*, *Empodisma minus* and *Lepidosperma limicola* (LeBreton 1996). Lebreton found that Tetrarrhena and Baeckia were strongly correlated with the presence of the skink, as was the presence of permanently wet soil.

Assessment of Newnes Plateau Shrub Swamp: The wet areas associated with the northern and southern watercourse were closely inspected to see if they complied with the definition of this swamp type (Benson and Keith 1990). In brief, these swamps are described as typically, narrow, elongate swamps that lie in the upland valleys on the plateau. The swamps are dominated by shrubs and range from open-scrub to closed heath, with sedges dominating in the wetter areas. There appears to be great floristic variation between swamps; trees are normally absent but they are often fringed by *Eucalyptus mannifera* or *E. gregsoniana*.

The most extensive shrub types are various species of Tea Tree (*Leptospermum sp.*), along with *Baeckae linifolia* and *B. utilis*, *Grevillea acanthifolia*, *Epacris paludosa*

and *E. microphylla* and *Boronia deanei*. Very dense vegetation often forms along the permanent water channels, such as Coral fern *Gleichenia dicarpa* and Button Grass. Other plant types are listed in Benson and Howell (1990).

Results

Blue Mountains Water Skink Habitat: Habitat for the Blue Mountains Water Skink is not readily apparent on the study site. The lower section of the Northern watercourse descends into a well marked watercourse that is lined with Coral Fern, Callicoma and Tea Tree and it is only in this area that evident habitat for the skink is present. This area lies immediately east of the study site (Figure 2), inside the World Heritage Area. While it may be possible that the skinks could travel upstream from the habitat area, they are unlikely to proceed far onto the study site as the vegetation changes abruptly at the eastern-most survey track (near the site boundary). The creek-side vegetation quickly gives way to sparse Tea-Tree with Mat Rush (*Lomandra longifolia*) ground cover that would provide little shelter or foraging habitat for these skinks

Newnes Plateau Shrub Swamp: The two "wet" areas on the northern and southern watercourse was surveyed to assess the floristic composition and the structural characteristics of the areas. Both areas contain plants that occur in Newnes Plateau Shrub Swamp but the range of plants seems to be very limited and dominated by only one or two species. The "wet" area on the northern watercourse is very small and contains only three or four of the listed plant species. It is not until the northern watercourses crosses the eastern site boundary that more plant species associated with the Shrub Swamp community begin to appear. The northern zone is so narrow that it is only a few metres wide in places. It does not seem to fit the structural definition of Newnes Plateau Shrub Swamp in that it is not extensive, is not on a low slope and does not have permanent wet areas associated with it and lacks many of the requisite plant species.

The "wet" area on the southern watercourse is larger than that on the northern watercourse and is dominated by Tea Tree, particularly *Leptospermum trinervum*, which is not typically associated with this swamp habitat. *L. grandifolium*, which occurs in Newnes Plateau Shrub Swamp is present here but as a minor species. The southern "wet" area, while wider than the northern watercourse area, is still quite restricted and could not be considered to be extensive. It is also a dry site and there is no open water; the ground is very sandy and there are few damp areas underfoot. The southern "wet" area is floristically closer to Newnes Plateau Shrub Swamp than the northern area, but structurally it is probably not a swamp.

Discussion

Blue Mountains Water Skinks: The study site does not appear to contain habitat for these skinks. The northern watercourse is, however, continuous with habitat that appears to be suitable for them (Figure 2). As the skinks are known to occur in the local area it is prudent to assume that the skinks use the area below the northern watercourse and that all steps should be taken to protect this habitat (in the World Heritage Area). The measures should include the erection of devices (such as silt screens) upstream of the habitat area while still maintaining water flow in the watercourse. The measures employed should retain water quality in the watercourse while not disrupting water flow.

It is also recommended that targeted surveys be carried out for the skinks (in the World Heritage Area), and should the skinks be found, a monitoring program be established to monitor the response of the skinks (and the habitat) to works occurring in the study site.

Newnes Plateau Shrub Swamp: Newnes Plateau Shrub Swamp appears to be absent from the northern watercourse on the study site. It is difficult to know whether the Tea-Tree or "wet" area on the southern watercourse should be considered to be Newnes Plateau Shrub Swamp as it lacks most of the structural components of this ecological community.

References Cited

Benson, D. H., and D.A Keith (1990). The natural vegetation of the Wallerawang 1:100,000 map sheet. Cunninghamia 2(2): 305-335.

LeBreton, M. (1996). Habitat and distribution of the Blue Mountains Water Skink (*Eulamprus leuraensis*). BSc Honours Thesis. University of New South Wales.

NPWS (2001) The recovery plan for the Blue Mountains Water Skink (*Eulamprus leuraensis*). NSW National parks and Wildlife Service, Hurstville.

White, A.W. (2002a). Surveys for the Blue Mountains Water Skink *Eulamprus leuraensis* Newnes State Forest. Prepared for Power Coal Pty Ltd.

White, A.W. (2002b). Surveys for the Giant Burrowing Frog *Heleioporous australiacus*, Newnes Kaolin Site. Prepared for Newnes Kaolin Pty Ltd.

White, A.W. (2003). Assessment of the potential impacts of the expansion of sand quarrying at Kables Sands Pty Ltd, Clarence, on the Blue Mountains Water Skink Skink (*Eulamprus leuraensis*). Prepared for Kables Sands Pty Ltd.

Dr Arthur White

24 March 2004.

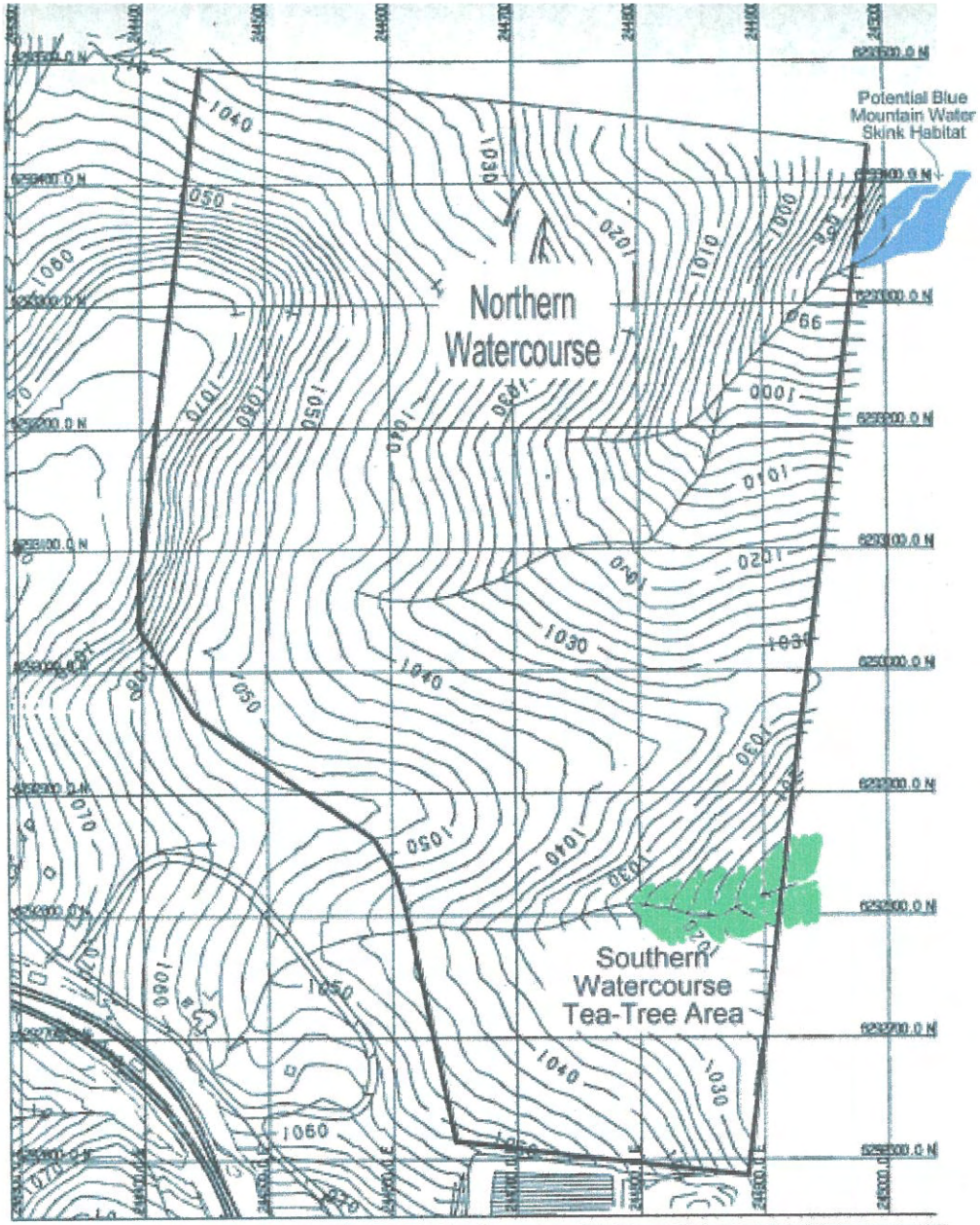


Figure 1

NEWNES KAOLIN SITE

Watercourses and Habitat Areas Scale 1: 4,000

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

APPENDIX C

Combined flora species recorded on the subject site (IEC 2003; P & J Smith 2003; HWR 2004)

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

Key	
A	Current surveys undertaken by HWR (2003)
B	Previous surveys by Smith & Smith (2003) and International Environmental Consultants (EIS) 2003

Family/Class Name	Species Scientific Name	Species Common Name	A	B
Class LYCOPSIDA	**Clubmosses and Quillwarts**			
LYCOPODIACEAE	*Lycopodium deuterodensum*	Bushy Clubmoss	✓	✓
GLEICHENIACEAE	*Gleichenia dicarpa*	Pouched Coral-fern	✓	
DENNSTAEDTIACEAE	*Calochlaena dubia*	False Bracken	✓	
	Pteridium esculentum	Bracken	✓	✓
LINDSAEACEAE	*Lindsaea linearis*	Screw Fern	✓	✓
DICKSONIACEAE	*Calochlaena dubia*			✓
SCHIZAEACEAE	*Schizaea bifida* s. str.	Forked-comb fern		✓
BLECHNACEAE	*Blechnum cartilagineum*	Gristle Fern	✓	✓
	Blechnum nudum	Fishbone Water-fern	✓	✓
Class MAGNOLIDAE	**Flowering Plants**			
LAURACEAE	*Cassytha melantha*	Devils Twine	✓	
RANUNCULACEAE	*Clematis aristata*	Toothed Clematis	✓	
DILLENIACEAE	*Hibbertia cistifolia*			✓
	Hibbertia obtusifolia s.str.	Blunt-leaf Guinea-flower	✓	
RHAMNACEAE	*Pomaderris andromedifolia*		✓	✓
EUPHORBIACEAE	*Amperea xiphoclada*	Broom Spurge	✓	✓
	Poranthera microphylla	Small Poranthera	✓	
TREMANDRACEAE	*Tetratheca rubioides*			✓
VIOLACEAE	*Hybanthus monopetalus*	Slender Violet-bush	✓	✓
	Viola hederacea	Ivy-leaf Violet	✓	✓
DROSERACEAE	*Drosera sphathulata*	Common Sundew	✓	
CASUARINACEAE	*Allocasuarina littoralis*	Black She-oak	✓	
CUNONIACEAE	*Callicoma serratifolia*	Black Wattle	✓	✓
MALACEAE	*Cotoneaster glaucophyllus*	Cotoneaster	✓	
PROTEACEAE	*Banksia conferta* var.*penicillata*		✓	
	Banksia cunninghamia		✓	
	Banksia marginata	Silver Banksia	✓	✓
	Banksia oblongifolia	Spoon-leaf Banksia	✓	✓
	Banksia oblongifolia	Spoon-leaf Banksia	✓	✓
	Banksia serrata	Saw Banksia	✓	✓
	Banksia spinulosa var. *spinulosa*	Hairpin Banksia	✓	✓
	Grevillea laurifolia	Laurel Grevillea	✓	✓
	Hakea laevipes ssp. *laevipes*		✓	✓
	Hakea pachyphylla		✓	✓
	Isopogon anethifolius	Narrow-leaf Drumstick		✓
	Isopogon prostratus	Prostrate Drumstick		✓
	Isopogon anemonifolius	Broad-leaf Drumsticks	✓	✓
	Lomatia silaifolia	Crinkle Bush	✓	✓
	Persoonia chamaepitys	Prostrate Geebung	✓	✓
	Persoonia laurina subsp. *laurina*	Laurel-leaf Geebung	✓	✓
	Persoonia levis	Broad-leaf Geebung	✓	✓
	Persoonia myrtilloides	Myrtle Geebung		✓
	Petrophile canescens			✓
	Petrophile pulchella	Conesticks	✓	✓
	Telopea speciosissima	Waratah	✓	✓

Family/Class Name	Species Scientific Name	Species Common Name	A	B
MYRTACEAE	*Eucalyptus blaxlandii*	Blaxland's Stringybark	✓	✓
	Eucalyptus laophila		✓	✓
	Eucalyptus mannifera	Brittle Gum	✓	✓
	Eucalyptus piperita	Sydney Peppermint	✓	✓
	Eucalyptus radiata ssp. *radiata*	Narrow-leaved Peppermint	✓	✓
	Eucalyptus sclerophylla	Hard-leaved Scribbly Gum	✓	✓
	Eucalyptus sieberi	Silvertop Ash	✓	✓
	Eucalyptus sparsifolia	Narrow-leaved Stringbark	✓	✓
	Baeckea linifolia	Swamp Baeckea	✓	✓
	Leptospemum macrocarpum			✓
	Leptospermum myrtifolium	Swamp Tea-tree		✓
	Leptospermum arachnoides	Spider Teatree	✓	✓
	Leptospermum continentale	Prickly Tea-tree	✓	✓
	Leptospermum grandifolium	Wooly Tea-tre	✓	✓
	Leptospermum juniperinum	Prickly Teatree	✓	✓
	Leptospermum polygalifolium	Yellow Tea-tree	✓	✓
	Leptospermum sphaerocarpum	Round-fruited Tea-tree	✓	✓
	Leptospermum trinervium (narrow leaf form)	Flaky-bark Tea-tree	✓	✓
	Leptospermum trinervium (broad leaf form)	Flaky-bark Tea-tree	✓	✓
HALORAGACEAE	*Gonocarpus tetragynus*	Poverty Raspwort	✓	✓
	Gonocarpus teucroides	Raspwort	✓	✓
RUTACEAE	*Boronia microphylla*	Small-leaved Boronia	✓	✓
FABACEAE	*Bossiaea heterophylla*	Variable Bossiaea	✓	✓
	Davesia latifolia	Broad-leaf Bitter Pea	✓	✓
	Daviesia acicularis			✓
	Daviesia squarrosa			✓
	Daviesia ulicifolia	Gorse Bitter-pea	✓	✓
	Gompholobium latifolium	Broad-leaf Wedge-pea	✓	✓
	Hovea ? Heterophylla		✓	✓
	Mirbelia platyloboides		✓	✓
	Phyllota squarrosa	Dense Phyllota	✓	✓
	Pultenaea scabra	Rough Bush-pea	✓	✓
MIMOSOIDEAE	*Acacia myrtifolia*	Myrtle Wattle		✓
	Acacia falcata	Sickle Wattle	✓	
	Acacia implexa	Hickory	✓	
	Acacia longifolia	Sydney Golden Wattle	✓	✓
	Acacia obtusifolia		✓	✓
	Acacia terminalis	Sunshine Wattle	✓	✓
	Acacia ulicifolia	Prickly Moses	✓	✓
SANTALACEAE	*Choretum pauciflorum*	Dwarf Sourbush	✓	✓
	Leptomeria acida	Native Current	✓	✓
	Omphacomeria acerba	Leafless Sour Bush	✓	✓
PITTOSPORACEAE	*Billardiera scandens*	Apple-berry	✓	✓
	Rhytidosporum procumbens	Marianthus	✓	✓
POLYGALACEAE	*Comesperma ericinum*	Matchheads		✓
	Comesperma volubile	Love Creeper		✓
ARALIACEAE	*Polyscias sambucifolia*	Elderberry Panax	✓	✓
APIACEAE	*Xanthosia stellata*			✓
	Hydrocotyle peduncularis	Hairy Pennywort	✓	✓
	Platysace lanceolata	Native Parsnip	✓	✓
	Platysace linearifolia	Narrow-leaf Platysace	✓	✓
	Xanthosia pilosa	Hairy Xanthosia	✓	
ASTERACEAE	*Arrhenechthites mixta*	Purple Fireweed	✓	✓

Family/Class Name	Species Scientific Name	Species Common Name	A	B
	Cassinia aculeata	Dollybush	✓	✓
	Helichrysum adenophorum var. *waddelliae*	Waddel Everlasting	✓	✓
	Helichrysum Leucopsideum	Satin Everlasting		✓
	Helichrysum rutidolepis	Pale Everlasting		✓
	Helichrysum scorpioides		✓	✓
	Hypochoeris radicata	Flatweed	✓	
CAMPANULACEAE	*Wahlenbergia* sp.			✓
EPACRIDACEAE	*Epacridaceae* sp.			✓
	Brachyloma daphnoides	Daphne Heath	✓	✓
	Epacris microphylla	Small-leaf Heath	✓	✓
	Epacris pulchella	Coral Heath	✓	✓
	Leucopogon lanceolatus	Lance-leaf Beard-heath	✓	✓
	Monotoca scoparia	Prickly Broom-heath	✓	✓
LAMIACEAE	*Prostanthera scutellarioides*	Coast Mint-bush		✓
GOODENIACEAE	*Goodenia dimorpha* var. *dimorpha*			✓
	Dampieria stricta	Blue Dampieria	✓	✓
	Goodenia bellidifolia ssp. *Bellidifolia*	Daisy-leaved Goodenia	✓	✓
LOGANIACEAE	*Mitrasacme polymorpha*	Mitre Weed	✓	✓
RUBIACEAE	*Galium binifolium*	Bedstraws	✓	
	Galium propinquum	Maori Bedstraw	✓	
	Pomax umbellata	Pomax	✓	✓
SCROPHULARIACEAE	*Veronica plebeia*		✓	
Subclass LILIDAE	**Monocotyledons**			
LOMANDRACEAE	*Lomandra cylindrica*	Needle Mat-rush		✓
	Lomandra glauca subsp. *glauca*	Glaucous Mat-rush	✓	
	Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush	✓	✓
	Lomandra longifolia subsp. *longifolia*	Spiny Mat-rush	✓	✓
	Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush	✓	
XANTHORRHOEACEA*E*	*Xanthorrhoeae resinifera*	Spear Grass-tree		✓
	Xanthorrhoeaea media	Sydney Grass-tree	✓	
	Xanthorrhoea resinosa	Sydney Swamp Grass-tree	✓	✓
PHORMIACEAE	*Dianella caerulea* var. *caerulea*	Rough Flax Lily	✓	✓
	Dianella prunina			✓
	Dianella revoluta	Mauve Flax Lily	✓	✓
IRIDACEAE	*Patersonia sericea*	Silky Purple-flag	✓	✓
	Patersonia fragilis	Glabrous Purple-flag	✓	✓
	Patersonia glabrata	Cauline-leaf Purple-flag	✓	✓
ORCHIDACEAE	*Acianthus* sp.			✓
	Caladenia dimorpha			✓
	Diuris sulphurea	Tiger Orchid		✓
	Genoplesium sp.			✓
	Pterostylis tunstallii			✓
	Pterostylis concinna	Trim Greenhood		✓
	Orthoceras strictum	Horned Orchid	✓	
HAEMODORACEAE	*Haemodorum planifolium*	Bloodroot	✓	✓
	Haemodorum corymbosum	Rush-leaf Bloodroot		✓
XYRIDACEAE	*Xyris gracilis* subsp. *gracilis*	Slender Yellow-eye	✓	✓
JUNCACEAE	*Juncus planifolius*			✓
	Juncus continuus	Sand Rush	✓	✓

Family/Class Name	Species Scientific Name	Species Common Name	A	B
CYPERACEAE	*Caustis flexuosa*	Curved Caustis	✓	✓
	Gahnia filifolia		✓	✓
	Gahnia microstachya	Slender Saw-sedge	✓	✓
	Gahnia sieberiana	Red-fruited Saw-sedge	✓	✓
	Lepidosperma laterale	Variable Sword-sedge	✓	✓
	Lepidosperma limicola	Razor Sword-sedge	✓	✓
	Lepidiosperma tortuosum		✓	✓
	Schoenus brevifolius	Zig-zag Bog-rush		✓
	Schoenus melanostachys	Black Bog-rush		✓
	Schoenus villosus	Hairy Bog-rush	✓	✓
RESTIONACEAE	*Empodisma minus*	Spreading Rope-rush	✓	✓
	Lepyrodia muellerii		✓	
	Lepyrodia scariosa	Chaffy Scale-rush	✓	✓
	Restio australis		✓	✓
POACEAE	*Aristida benethamii* var*. benthamii*			✓
	Aristida personata			✓
	Austrostipa pubescens	Tall Spear Grass	✓	✓
	Austrostipa rudis		✓	✓
	Dichelachne inaequiglumis		✓	✓
	Entolasia stricta	Wiry Panic	✓	✓
	Joycea pallida	Red-anthered Wallaby Grass	✓	✓
	Microlaena stipoides var. stipoides	Weeping Grass	✓	✓
	Poa labillardieri	Tussock Grass	✓	
	Tetrarrhena turfosa		✓	
	Poa sieberana		✓	✓

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

APPENDIX D

Newnes Plateau Shrub Swamp community (Benson & Keith 1990)

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

The natural vegetation of the Wallerawang 1:100 000 map sheet

D.H. Benson and D.A. Keith

Abstract

Benson, D.H. & Keith, D.A. (National Herbarium of New South Wales, Royal Botanic Gardens, Sydney, Australia 2000) 1990. The natural vegetation of the Wallerawang 1:100 000 map sheet. Cunninghamia 2(2): 305–335.* The composition and extent of the present natural vegetation on the Wallerawang 1:100 000 map sheet 8931 (lat. 30°00′– 33°30′S, long. 150°00′–150°30′E) are described and mapped from aerial photography and field traverses. The structure, characteristic species, and associated environmental factors for 18 map units with 29 plant communities are described. These communities include small areas of eucalypt tall open-forest, extensive tracts of open-forest and woodland, and localised patches of sclerophyllous heath and shrub swamp.

The vegetation patterns are influenced by geology (mainly sedimentary and metasedimentary rocks), soil types (mainly low nutrient acid soils) and physiography (dissected sandstone plateaus and deep gorges), as well as modified by elevation (ranging from 400 m to almost 1200 m above sea level) and rainfall (ranging from 620 mm to 1220 mm per annum).

Significant plant communities and 23 rare species are listed. There is a need to conserve representative samples of plant communities on the western side of the map sheet and on the high elevation Newnes Plateau in particular, where proposals for extensive sand extraction threaten important woodlands, heaths and swamps. Particular concentrations of rare species occur on the Newnes Plateau, and in the Capertee Valley near Glen Davis. These areas may represent refugia during periods of climatic change.

Introduction

Massive orange sandstone cliffs, spectacular 'pagoda' country, the dry woodlands of the Wolgan and Capertee valleys, and a history of often isolated and short-lived mining and industrial activity in a harsh natural environment, provide the background to the different plant communities in this map sheet area.

The Wallerawang 1:100 000 Vegetation Map Sheet (based on Wallerawang 1:100 000 Topographic Sheet 8931, Royal Australian Survey Corps) is bounded by latitudes 33°00′–33°30′S, and longitudes 150°00′–150°30′E. It is located in the Central Tablelands botanical subdivision of New South Wales except for part of the north-east corner which is in the Central Coast subdivision. It is about 100 km north-west of Sydney and is due north of the Katoomba sheet (Keith & Benson 1988).

Geology and geomorphology

The Wallerawang map sheet area lies on the western edge of the Sydney Basin.

* Present address: N.S.W. National Parks and Wildlife Service, P.O. Box 1967, Hurstville, Australia 2220.

shrub- or sedge-swamps (map unit 20a). Mottled Gum, *Eucalyptus mannifera* (mostly subsp. *gullickii* though there are intergrades with subsp. *mannifera*) is the most common tree species though *E. radiata* subsp. *radiata*, *E. dives* and *E. dalrympleana* subsp. *dalrympleana* may also be present. *Eucalyptus pauciflora* subsp. *pauciflora* is common on the southern part on the plateau, above about 1170 m altitude.

The understorey is generally open, but with patches of locally denser scrub. The most common shrubs include *Leptospermum flavescens*, *L. myrtifolium*, *L. juniperinum*, *Hakea dactyloides*, *Lomatia silaifolia*, *Phyllota squarrosa* and *Boronia microphylla*. The open ground cover consists of *Helichrysum scorpioides*, *Dianella revoluta*, *Lomandra longifolia*, *Gahnia filifolia* and *Lepyrodia scariosa*.

Map unit 20a – 'Newnes Plateau Shrub-Swamps'

Closed-heath: *Leptospermum grandifolium – Baeckea linifolia – Grevillea acanthifolia*

Sedgeland: *Gymnoschoenus sphaerocephalus – Xyris ustulata*

Narrow, elongate, shrub-swamps are a conspicuous feature of the eastern half of the Newnes Plateau. These swamps are formed in characteristic low-slope headwater valleys, mostly tributaries of Carne Creek where sandy organic sediments are deposited from the surrounding ridges. These sediments are relatively deep, with a high organic matter content and sandy or loamy texture, and are periodically waterlogged. The swamp vegetation is essentially dominated by shrubs and varies in structure from open-scrub to closed-heath, with sedgeland dominated by graminoids in very wet sections. There is a considerable variation in the floristic composition, which is probably related to the soil type and the extent and duration of waterlogging. Soils on the western part of the plateau appear to have more clay than those of the eastern part, which are more sandy, while in each swamp the floristic composition is related to a drainage gradient from occasionally flooded sites to almost permanently running water. Trees are normally absent though there is generally a fringing open-woodland of *Eucalyptus mannifera* subsp. *mannifera* and occasionally the Mallee Snow Gum, *E. gregsoniana*. Dead trees in some swamps appear to indicate fluctuations in drainage conditions.

The most extensive plant community is dominated by shrubs, *Epacris paludosa*, *E. microphylla*, *Grevillea acanthifolia* subsp. *acanthifolia*, *Leptospermum grandifolium* (previously included with *L. lanigerum*), *Baeckea linifolia*, *B. utilis* and *Boronia deanei* with graminoids such as *Restio australis*, *Lepyrodia scariosa*, *Empodisma minus*, *Lepidosperma limicola*, *Xyris ustulata* and *Patersonia fragilis*. Local patterns appear to relate to drainage. Dense vegetation along permanent water channels within the swamp is dominated by *Gleichenia dicarpa* and *Gymnoschoenus sphaerocephalus* (Figure 5). In the drier, more open areas, there is an herbaceous ground cover with *Hydrocotyle* sp., *Viola hederacea* subsp. *sieberiana*, *Gonocarpus tetragynus* and *Xanthosia dissecta*.

In the swamps with a higher clay content, *Leptospermum* species are increasingly important, particularly *Leptospermum flavescens*, *L. myrtifolium*, *L. continentale* J. Thompson, and *L. obovatum*. Ground cover often includes *Restio australis*, *Juncus continuus* and *Lomandra longifolia*.

Periodic fire plays a part in modifying the structure of the shrub-swamp vegetation. After hot burns that kill all above ground vegetation, the sedges and smaller shrubs grow quickly in the increased light, to form a sedgeland, 0.3–0.5 m high. Some of the interesting locally restricted small shrub species such as *Boronia deanei, Dillwynia stipulifera* and *Celmisia* sp. aff. *longifolia* are conspicuous at this stage. The sedgeland is gradually overtopped by the taller growing shrubs, which gradually form a dense canopy about 2–3 m high.

The orientation of these swamps relate to the Deanes Creek Lineament and the Happy Valley Lineament which dominate the hydrology in the central part of the Newnes Plateau (Pecover 1984). The orientation of these swamps (NNE–SSW) contrasts markedly with the deeply incised easterly drainage pattern developed throughout much of the Blue Mountains and Wollemi National Parks and suggests a paleo-drainage pattern on the Newnes Plateau that is considerably older than drainage regimes that have formed many of the deeply incised valleys of the western Blue Mountains. Pecover (1984) suggests that the present land surface of the Newnes Plateau may be at or near the position of a paleo-land surface of Tertiary age or older.

Map unit 20b – 'Coxs River Swamps'

Closed-heath: *Leptospermum obovatum – Leptospermum continentale*

Sedgeland: *Carex* species

Alluvium-filled swamps near Ben Bullen along tributary creeks of the Turon River, and along the upper Coxs River and its tributaries north of Lidsdale are more clayey and perhaps have a higher nutrient status than the Newnes Plateau Shrub Swamps (map unit 20a). In more waterlogged areas there is closed-sedgeland of *Carex gaudichaudiana* and *C. fascicularis*, with herbs including *Viola caleyana, Stellaria angustifolia, Hydrocotyle tripartita, Mitrasacme serpyllifolia, Epilobium billardieranum* subsp. *hygrophyllum, Utricularia dichotoma*, and grasses including *Poa labillardieri* and *Deyeuxia quadriseta*. Sphagnum may be present. In other sites may be closed-heath with *Leptospermum obovatum, L. continentale* and *L. flavescens. Restio australis* and *Baeckea utilis* may be associated with more localized sandy textured soils. Drier areas carry *Poa labillardieri* grassland, occasionally with a light shrub cover of *Leptospermum continentale*. Open-forest of *Eucalyptus viminalis* and *E. dalrympleana* subsp. *dalrympleana* often surrounds these swamps.

Rather similar swamps are found at Hartley Vale and below Nellies Glen on the Katoomba map (Keith & Benson 1988).

Map unit 21c – 'Montane Heath'

Open-heath: *Allocasuarina nana – Banksia ericifolia – Leptospermum attenuatum – Phyllota squarrosa*

Spectacular areas of open-heath are found at high elevations (above 850 m) (Figure 6), mainly on the southern half of the Newnes Plateau, particularly to the north of Lithgow. Heath occupies exposed ridgetops with skeletal sandy soils derived from Narrabeen Group sandstones. Major shrub species are *Allocasuarina nana, Leptospermum attenuatum, L. arachnoides, Isopogon anemonifolius, Banksia ericifolia* var. *ericifolia, Hakea dactyloides*

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

APPENDIX E

Fauna surveys undertaken by Gunninah Environmental Consultants

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

Proposed Sand Extraction and Kaolin Mine
Newnes Junction

Fauna Investigations Report

May 2004

Proposed Sand Extraction and Kaolin Mine
Newnes Junction

Fauna Investigations Report

May 2004

F Dominic Fanning

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

PROPOSED SAND EXTRACTION and KAOLIN MINE

NEWNES JUNCTION

FAUNA INVESTIGATIONS REPORT

May 2004

1 INTRODUCTION

A combined sand and kaolin mining operation is proposed on the Newnes plateau, approximately 7km east of Lithgow and 90km northwest of the CBD of Sydney (see IEC 2003; Figure 2.1). The mining operation is to be undertaken in the immediate vicinity of the township of Newnes Junction, and in close proximity to an existing sand mining operation and the Clarence colliery (see IEC 2003; Figure 2.2).

The proposed mining operation has been the subject of an *Environmental Impact Statement* (EIS), prepared by International Environmental Consultants (IEC 2003). The EIS contained an account of the natural environment of the subject land and surrounding lands, and an assessment of the likely impacts of the mining activity as proposed.

A number of submissions were received in respect of the exhibited EIS and mining application, including a number of specific submissions and comments with respect to the flora and fauna of the subject land and the likely or potential impacts of the proposed development. This *Fauna Investigations Report*:

- provides a response to those submissions;
- co-ordinates and collates existing information regarding native fauna and their habitats on the subject land and in its immediate vicinity; and
- incorporates the findings of supplementary investigations conducted on the subject land.

2 INFORMATION BASE

The data and information upon which this *Report* is based are derived from a number of sources including:

- the investigations conducted for the EIS prepared by International Environmental Consultants (IEC 2003), and other information contained in the EIS;
- data obtained from other investigations in the vicinity, including on the adjoining Rocla sand mining operations (IEC);
- the Wildlife Atlas maintained by the NSW National Parks & Wildlife Service (NPWS)[1];
- data obtained from submissions on the original EIS and mining application, particularly those contained in the submission provided by P & J Smith (2003); and
- supplementary investigations undertaken specifically for this *Report* in response to matters raised in submissions to the original EIS.

[1] The NPWS has recently been incorporated into the NSW Department of Environment & Conservation (DEC).

2.1 Original EIS Investigations

The EIS prepared for the sand and kaolin mining operations at Newnes (IEC 2003) incorporated data derived from:

- previous investigations in the vicinity and general locality;
- a search of the DEC Wildlife Atlas; and
- the results of dedicated field investigations on the subject land for the proposed mining operation.

Fauna investigations were undertaken by IEC on the subject land between the 20th and 24th of March 2000, involving the conduct of dedicated fauna surveys:

- trapping using small and medium Elliott traps and hair tubes;
- spotlighting investigations along tracks and survey lines throughout the site;
- diurnal investigations throughout the subject site; and
- the use of call playback for forest owls, the koala and several gliders.

A supplementary dedicated investigation for threatened amphibian fauna was undertaken, as reported in the EIS (IEC 2003), by Dr Arthur White (Biosphere 2003) with particular emphasis on the Giant Burrowing Frog and Red-crowned Toadlet. Investigations for these species were undertaken in early May 2003, and involved walked surveys of potentially suitable habitat, spotlighting and call playback. Those investigations included opportunistic observations of other native biota, particularly other amphibians and reptiles such as the Blue Mountains Water Skink.

2.2 Other Investigations in the Vicinity

References were also made in the original EIS to other surveys which had been undertaken for native flora and fauna in the immediate vicinity, including on land located to the immediate northwest - the Clarence Colliery site (Corkery & Co 1993; IEC 2000).

2.3 DEC Wildlife Atlas Records

A supplementary inspection of the DEC Wildlife Atlas was undertaken during preparation of this *Report* to complement the information previously obtained from the database.

2.4 Information Obtained from Submissions

Additional information was provided in several of the submissions lodged with the consent authority[2] in respect of the proposed sand and kaolin mine at Newnes. Of particular value in this regard is the submission provided by P & J Smith, a biological consulting firm located in the Blue Mountains.

The submission by P & J Smith (2003) was based on only a relatively short investigation of the subject site, but provides some additional information regarding native fauna (as well as flora) recorded on the site. That information has been incorporated into this *Report*, and supplementary investigations were undertaken specifically with respect to the Blue Mountains Water Skink *Eulamparus leuraensis*, microchiropteran bats and arboreal fauna.

[2] The Consent Authority is the Department of Infrastructure Planning & Natural Resources (DIPNR).

2.5 Supplementary Fauna Investigations

Dedicated fauna surveys were undertaken in early 2004 to provide additional information regarding native biota present on the subject site or which could potentially be present.

Additional fauna surveys were undertaken in March 2004 (by Gunninah Environmental Consultants and by Biosphere Consultants) to supplement the original fauna investigations undertaken for the EIS (IEC 2003; Biosphere 2003).

The supplementary fauna investigations conducted by Gunninah (see Attachment) covered the full spectrum of native fauna with a particular emphasis on potential threatened species including microchiropteran bats, the Blue Mountains Water Skink, forest owls and arboreal mammals, and terrestrial fauna.

A supplementary inspection of the subject site was also undertaken by Biosphere Consultants (Appendix B to the *Supplementary Submission*) on the 17th of March 2004 with particular emphasis on potential habitat for and the possible presence of the Blue Mountains Water Skink. This *Report* provides an assessment of the moist habitats on the site with respect to the Newnes Plateau Shrub Swamp community.

3 RESULTS of the SUPPLEMENTARY INVESTIGATIONS

3.1 Fauna Habitat Features

The drainage lines on the subject site were the focus of investigations particularly for the Blue Mountains Water Skink, but also for threatened amphibians which could occur on the site. As indicated in the *Supplementary Flora Report* prepared by HWR Pty Ltd (Appendix A to the *Supplementary Submission*), small areas of swampy or riparian habitat are located along a drainage line through the centre of the site and a drainage line in the southeastern part of the site. Although these patches of vegetation are small, they were investigated as potential habitat for the Blue Mountains Water Skink, and were also surveyed for other herpetofauna.

Additional mapping of relevant resources for native biota include particularly the identification of areas of the site containing hollow-bearing trees (Figure 1). Trees containing hollows are a significant resource for many native biota, including microchiropteran bats, some birds (such as parrots and kingfishers), forest owls, arboreal mammals and some herpetofauna species.

Hollow-bearing trees are scattered throughout the subject site, as indicated in Figure 1. Given that the majority of the site is forested, that result is not regarded as remarkable notwithstanding previous disturbances and modifications to the vegetation communities present on the land.

It should be noted that most of the tree-hollows present on the site are relatively small, and there are few large hollow-bearing trees. None of the trees present are of sufficient size to form or constitute breeding hollows for the large forest owls (the Powerful Owl, Masked Owl, Sooty Owl and Barking Owl), and these species would only be expected to utilise the site for foraging purposes as part of a much larger home range.

Rock outcrops are of extremely limited distribution on the subject site, and there are no significant cliffs, caves or other similar rocky habitats.

As noted by Biosphere (Appendix B to the *Supplementary Submission*), the subject site does not support significant habitat or resources for the Blue Mountains Water Skink, and the species is not expected to occur on the site.

3.2 Blue Mountains Water Skink

The initial investigations on the subject land (IEC 2003; Biosphere 2003) did not identify habitat of particular suitability or potential value for the Blue Mountains Water Skink. Furthermore, no specimens of this species were recorded during those earlier investigations. The supplementary investigations which have been conducted for this *Report* (including those by Gunninah Environmental Consultants and by Dr Arthur White of Biosphere Consultants) included targeted surveys for the Blue Mountains Water Skink and its habitat on the subject land. Despite the conduct of dedicated surveys for this species, the Blue Mountains Water Skink has not been recorded on the subject site at Newnes.

3.3 Microchiropteran Bats

The supplementary investigations undertaken by Gunninah provide additional data on the microchiropteran bats present on the subject site, including threatened species. The presence of hollow-bearing trees and extensive forested woodland vegetation (both in the subject site and on the extensive adjoining conservation reserves) provide substantial habitat for the threatened microchiropteran bats which either have been recorded on the site or which could be expected to occur. A number of additional species beyond those which have been recorded are likely to occur, although cave-dwelling species would only utilise the site for foraging purposes.

A total of five microchiropteran bats were recorded on the subject site, including two threatened species (the Common Bent-wing Bat and the Eastern False Pipistrelle). The Common Bent-wing Bat utilises caves and similar man-made structures for roosting purposes, and there are no suitable resources in this regard on the subject site. The Eastern False Pipistrelle utilises tree-hollows for roosting, and whilst the subject site supports such resources, these are also characteristic of the extensive conservation reserves in the immediate vicinity and general locality. Similarly, whilst the subject site supports suitable forest habitat for foraging by both species, there are substantial areas of such habitats and resources in the immediate vicinity, general locality and general region.

The subject site is not regarded as of conservation significance for any threatened microchiropteran bat species. There are very extensive similar or identical habitats in the substantial areas of adjoining conservation reserves. The extremely small area of the subject site in relation to the extent of the protected habitats for these species, and the lack of significant or notable resources or features for threatened microchiropteran bats, preclude the site from constituting a significant resource for this group of threatened biota.

Consideration of the likelihood or otherwise of a "*significant effect*" being imposed upon the Common Bent-wing Bat, Eastern False Pipistrelle or other threatened microchiropteran bats has been incorporated into the *Supplementary Submission* for the Newnes project provided by Gunninah Environmental Consultants to DIPNR. The conclusion of those Assessments of Significance pursuant to s.5A of the EP&A Act is that a "*significant effect*" is not "*likely*" to be imposed upon any threatened microchiropteran bats.

3.4 Other threatened Biota

No additional threatened fauna species were recorded from the subject site during the supplementary investigations in early 2004. With respect to threatened fauna, the vegetation and habitat features on the subject site are not regarded as remarkable or of particular significance or value, and it is not considered likely that the subject site constitutes a significant resource for any threatened fauna species.

No evidence of any of the threatened large forest owls (the Powerful Owl, Masked Owl, Barking Owl and Sooty Owl) has been recorded from the site. Whilst individuals of these species could doubtless utilise the site for foraging purposes as part of a much larger home range, the site itself is not regarded as of significance in this regard.

Consideration of the likelihood or otherwise of a "*significant effect*" being imposed upon any threatened fauna species has been considered in the *Supplementary Submission* provided by Gunninah Environmental Consultants to DIPNR with respect to the proposed mining operations at Newnes Junction. Consideration of the eight factors of s.5A of the EP&A Act, and of other relevant matters (including the extent of conservation reserves in the locality and region, the location and size of the subject site, the proposed impact amelioration measures and the distributions of relevant threatened biota) leads to the conclusion that it is not "*likely*" that a "*significant effect*" would be imposed upon any "*threatened species, populations or ecological communities, or their habitats*".

As a consequence, a *Species Impact Statement* (SIS) is not required for the proposed mining operation at Newnes Junction. Furthermore, there is no reasonable justification for refusal of development consent with respect to either s.5A or s.79C of the EP&A Act.

Proposed Sand Extraction and Kaolin Mine
Newnes Junction

Details of Fauna Investigations
March 2004

Supplementary Fauna Survey Methods, Efforts and Results
Gunninah - March 2004

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

FAUNA SURVEY METHODS

A combination of standard survey techniques were employed on the subject land to identify the fauna species present and those that could occur on occasion. The selection of particular survey methods was made with regard to the habitats present on the site, the fauna assemblage expected to occur, previous studies, and threatened species previously recorded in the locality. Field investigations specifically focused on those threatened fauna species that were poorly represented in previous studies on the subject site or which required further assessment.

Fauna surveys were conducted within the subject land in mid-March 2004 (Table 1). Weather conditions were warm to mild, with a slight breeze during the afternoons and evenings. Nights were cold to mild with some background light and industrial noise from the adjacent Clarence Colliery.

Table 1 Summary of fauna survey methods and effort (excluding opportunistic records) applied during field investigations on the subject land at the proposed Newnes Sand and Kaolin Mine.

Survey Method	Total Effort	Date	Target Species
Diurnal bird and herpetofauna census	27 person-hours	15-18 March	birds, reptiles and amphibians
Nocturnal call playback	3 hours	15-18 March	nocturnal avifauna (*eg* owls), arboreal mammals and amphibians (Red-crowned Toadlet and Giant Burrowing Frog)
Ultrasonic call recording	3 hours	15 -18 March	microchiropteran bats
Spotlighting	18 person-hours	15-18 March	nocturnal mammals, amphibians (Red-crowned Toadlet and Giant Burrowing Frog), reptiles and avifauna
Harp trapping	15 trap-nights	15-18 March	microchiropteran bats
Diurnal Blue Mountains Water Skink surveys	8 person-hours	15-18 March	targeted searches for the Blue Mountains Water Skink
Hollow-bearing tree and Scat, Tracks and Traces Surveys	8 person-hours	15-18 March	searches and mapping of hollow-bearing trees and indirect evidence of fauna within the landscape

Fauna surveys included both diurnal and nocturnal investigations. Diurnal fauna surveys consisted of visual and aural censuses of avifauna, herpetofauna and mammalian fauna. Nocturnal fauna surveys included the use of remote ultrasonic bat detectors and call playback, as well as aural and direct visual census using spotlights, and harp-trapping.

Diurnal herpetofauna surveys, including targeted Blue Mountains Water Skink, Giant Burrowing Frog and Red–crowned Toadlet searches, were conducted by direct investigation of potential habitats, and the identification audible calls. Diurnal avifauna and mammalian survey techniques incorporated both traverses and stationary observations along tracks and trails.

Nocturnal spotlight surveys included both visual and aural censuses along tracks and trails, and at regular stationary positions. Nocturnal call playback involved the broadcasting of pre-recorded avifauna and amphibian calls at a number of locations and the identification of response calls. Ultrasonic call detection involved the recording of microchiropteran bat calls using an Anabat II™ recorder, and later identification of individual echolocation calls.

An investigation of trees and tree-hollows for evidence of native fauna (*eg* scratches, sap-feeding notches, nesting material, owl white-wash, dreys, and foraging signs) was undertaken throughout both nocturnal and diurnal survey periods. The approximate locations of hollow-bearing trees have also been documented (Figure 1). General searches for other indirect evidence of fauna activities (such as scats, prints, remains, feathers, bones, fur, nests, burrows and diggings) was undertaken on an opportunistic basis throughout the field investigations on the subject land.

The presence of relevant features or resources (such as hollow-bearing trees, rock outcrops, hollow logs, specific food trees, water features *etc*) which could be of potential significance for native fauna was recorded during the survey. In particular, attention was paid to resources of relevance to threatened fauna known from the locality, including the large forest owls, Blue Mountains Water Skink, Red-crowned Toadlet and microchiropteran bat species.

Records were maintained of all opportunistic observations of fauna species (by direct or indirect evidence) during the investigations on the subject land, and an inventory compiled including all species detected (Appendix B to the *Supplementary Submission*).

Fauna identifications conform largely to nomenclature in Christidis & Boles (1994) and Pizzey & Knight (1997) for avifauna, Cogger (2000) for herpetofauna, Strahan (1995) and Menkhorst & Knight (2001) for most mammals, and Churchill (1998) for microchiropteran bats.

1 Fauna Survey Techniques (excluding trapping)

General fauna survey techniques were conducted across the subject site and involved:

- identification and assessment of the nature and condition of habitats and specific resources and features of relevance for native fauna present;
- dedicated searches for indirect evidence of fauna (*ie* scats, feathers, fur, tracks, dens, nests, scratches, chew marks, owl whitewash *etc*); and
- incidental records of fauna observed on the site and in the vicinity, maintained throughout the survey period.

Specific survey techniques were also employed to enable the detection of the more cryptic and difficult to locate fauna species (*eg* nocturnal fauna) and in particular to target threatened fauna species.

Field surveys for fauna species were conducted from the 15th to the 18th of March 2004 inclusive. Details of specific techniques used, survey locations, survey effort and fauna recorded are provided below, with survey sites indicated on Figure 1.

1.1 Diurnal and Nocturnal Herpetofauna Census

Diurnal and nocturnal herpetofauna searches were conducted in association with avifauna and spotlight surveys at potentially suitable habitat sites, and on an opportunistic basis throughout the survey period (Tables 1 and 2). This involved searches amongst leaf litter and tree debris and under logs and rocks. In addition, targeted surveys for the Blue Mountains Water Skink and Red-crowned Toadlet were conducted in potentially suitable habitats across the subject site.

Table 2 Dedicated diurnal and nocturnal herpetofauna census survey results.

Date	Common Name	Species Name
15th March 2004	Mountain Dragon	*Tympanocryptis diemensis* *Lampropholis guichenoti*
16th March 2004	Copper-tailed Skink Red-throated Skink Eastern Banjo Frog	*Ctenotus taeniolatus* *Pseudemoia playnota* *Limnodynastes dumerilii* *Lampropholis guichenoti* *Lampropholis delicate*
17th March 2004	Copper-tailed Skink Mountain Dragon	*Ctenotus taeniolatus* *Tympanocryptis diemensis* *Lampropholis guichenoti*
18th March 2004	Mountain Dragon Red-throated Skink	*Tympanocryptis diemensis* *Pseudemoia playnota* *Lampropholis guichenoti* *Lampropholis delicata*
TOTAL	**1 amphibian species, 5 reptile species**	

1.2 Call Playback

Nocturnal and diurnal call playback involves the broadcasting of pre-recorded calls to elicit response calls from birds, mammals and amphibians which vocalise for territory proclamation or for social contact. Pre-recorded calls included the Powerful Owl, Barking Owl and Masked Owl. Some arboreal mammals (such as the Yellow-bellied Glider) are known to respond to nocturnal call playback of forest owl species.

The call of each owl species was played for 3 minutes followed by a 5-minute listening period at numerous locations at the subject site (Table 3). Foot-based spotlighting was also conducted in the surrounding area prior to, during and after the nocturnal call playback period.

Table 3 Call playback survey effort and results.

Date	Diurnal/ Nocturnal	Survey Effort (call playback hours)	Target Species	Response
15th March 2004	Nocturnal	0.5	Powerful Owl, Masked Owl, Barking Owl, Yellow-bellied Glider, Sooty Owl, Yellow-bellied Glider	nil
	Nocturnal	0.5	Powerful Owl, Masked Owl, Barking Owl, Sooty Owl	nil
16th March 2004	Nocturnal	0.5	Powerful Owl, Masked Owl, Barking Owl, Yellow-bellied Glider, Sooty Owl	nil
	Nocturnal	0.5	Red-crowned Toadlet, Giant Burrowing Frog	nil
17th March 2004	Nocturnal	0.5	Powerful Owl, Masked Owl, Barking Owl, Sooty Owl, Yellow-bellied Glider	Southern Boobook Owl
	Nocturnal	0.5	Red-crowned Toadlet, Giant Burrowing Frog	Nil
TOTAL		**3.0 hours**	**1 avifauna species**	

1.3 Bat Ultrasonic Call Recording

Microchiropteran bats were surveyed indirectly through the use of an Anabat II Bat Detector, which records their ultrasonic echolocation calls and harp-trapping (see below). This method is useful for the detection of high-flying bat species that are often under-sampled by bat (harp) trapping. Ultrasonic bat calls were recorded using an active trigger on the Anabat system allowing for extended recording. The Anabat systems were placed in a variety of locations before dusk each day and collected later in the night, after the peak activity period (Table 4).

Table 4 Bat ultrasonic call recording survey effort and results.

Date	Survey Effort (recording period)	Location	Triggered/ Traverse	Common Name	Scientific Name
15th March 2004	1 hour of recording	traverse	Triggered	results pending	
16th March 2004	1 hour of recording	traverse	Traverse	results pending	
17th March 2004	1 hour of recording	traverse	Triggered	results pending	
TOTAL	**3 hours**	**X Microchiropteran bat species**			

NB: (C) Confident species identification
(P) Probable species identification
(Po) Possible species identification

1.4 Diurnal Bird Census

Diurnal bird censuses involved dedicated searches across the subject site within a variety of habitat types. These searches were conducted during periods of high bird activity (early morning and late afternoon), as well as opportunistically throughout the survey period, with all species and individuals recorded.

A total of 37 bird species were recorded during the diurnal bird census period on the 15th, 16th, 17th and 18th of March 2004, with additional species recorded by opportunistic means throughout the field investigations. The dedicated diurnal bird census was conducted for a total of 27 person-hours over a 4-day period.

1.5 Spotlighting

Foot-based spotlighting surveys were conducted throughout the study area, to target nocturnal arboreal mammals, owls, amphibians and other nocturnal fauna. Fauna species were detected both visually and aurally (Table 5).

Table 5 Foot-based spotlighting survey effort and results.

Date	Survey Effort (person-hours)	Common Name	Scientific Name
6th August 2002	6	Greater Glider Sugar Glider Common Ringtail Possum	*Petauroides volans* *Petaurus breviceps* *Pseudocheirus perigrinus*
7th August 2002	6	Greater Glider Common Ringtail Possum	*Petauroides volans* *Pseudocheirus perigrinus*
8th August 2002	6	Red-necked Wallaby Greater Glider Tawny Frogmouth	*Macropus rufogriseus* *Petauroides volans* *Podargus strigoides*
TOTAL	**18 person-hours**	**4 mammal species and 1 avian species**	

2 Trapping Survey Techniques

2.1 Bat (Harp) Trapping

The purpose of bat (harp) traps is to capture low-flying species of microchiropteran bats. Traps were placed in perceived "*flyways*" along tracks or creeks or near waterbodies where microchiropteran bat flight paths could be interrupted. Captured bats (Table 6) were identified using external morphology, forearm measurement and body weight (Churchill 1998). Traps were checked each morning with the captured animals released at the point of capture.

Table 6 Bat (harp) trapping survey effort and results**.**

Date	Survey Effort (trap-nights)	Common Name	Scientific Name
15th March 2004	5	Chocolate Wattled Bat Lesser Long-eared Bat Goulds Long-eared Bat Large Forest Bat	*Chalinolobus morio* *Nyctophilus geoffroyi* *Nyctophilus gouldi* *Vespadelus darlingtoni*
16th March 2004	5	Chocolate Wattle Bat Lesser Long-eared Bat Goulds Long-eared Bat Large Forest Bat	*Chalinolobus morio* *Nyctophilus geoffroyi* *Nyctophilus gouldi* *Vespadelus darlingtoni*
17th March 2004	5	Chocolate Wattled Bat Goulds Long-eared Bat Large Forest Bat	*Chalinolobus morio* *Nyctophilus gouldi* *Vespadelus darlingtoni*
Total Survey Effort	**15 trap-nights**	**4 microchiropteran bat species**	

3 Habitat and Tracks, Scats and Traces Searches

3.1 Hollow-bearing Tree Assessment

Hollow–bearing trees provide essential nesting and roosting habitat for a number of species that utilise and are reliant on them. Analysis of the density of such features within the landscape allows a rough assessment of species diversity to be made and enables consideration of the potential for certain species to be present. More specifically, the distribution, density and individual characteristics of hollows provides a means for assessing the potential for particular threatened species (*eg* the large forest owls) to breed within the landscape.

Table 7 Hollow-bearing tree survey results.

Date	Number of hollow-bearing trees	Distribution of hollow-bearing trees	General hollow characteristics	Species predicted to use the resources
16-17th March 2004	approximately 60 -80	confined mostly to the older growth vegetation and the nutrient rich regions of the site on the mid- to lower-slopes and gullies	mostly small (5 to 15cm entrance diameter) with approximately 2-3 larger hollows scattered across the site	small to medium forest and woodland avifauna species, microchiropteran bats and small to medium arboreal mammals. Owls could potentially utilise the few larger hollows on the subject site, although no indirect evidence for such use was obtained.

3.2 Scats, Tracks and Traces Surveys

The survey for scats, tracks and other traces made by various fauna species provides an indirect and non-invasive way to assess the presence or absence of various species within the landscape. Many of the these traces are specific to a particular species (*eg* Glossy Black Cockatoo or Yellow-bellied Glider feeding signs), and permit an assessment the presence and relative abundance of a species within a particular landscape

Table 8 Scat, tracks and traces survey results

Date	Scat, Track or Trace	Species	Location
16th March 2004	regurgitated owl pellet	raptor species, possibly large forest owl	located on the northern boundary between trails 3 and 4

4 Weather Conditions

Weather conditions were recorded on a regular basis throughout the survey period (Table 9).

Table 9 Weather conditions recorded during the field investigations.

Date	Time	Wind	Cloud %	Rain	Night Light	Temperature °C
15th March 2004	Morning Afternoon Evening	n/a n/a 0	n/a n/a 80	n/a n/a 0	- - 2	n/a n/a 10-15
16th March 2004	Morning Afternoon Evening	1 1 1	90 10 80	0 0 0	- - 2	10-15 25-30 10-15
17th March 2004	Morning Afternoon Evening	0 1 1	70 40 100	0 0 0	- - 2	10-15 25-30 10-15
18th March 2004	Morning Afternoon Evening	0 n/a n/a	25 n/a n/a	0 n/a n/a	- n/a n/a	10-15 n/a n/a

Table 10 Standard reporting codes for climatic conditions.

Wind	Rain	Night Light	Temperature
0 = calm	0 = no evidence of rain in the last 24 hours	0 = very dark	Record as a range to the nearest 5 degrees
1 = light, leaves rustle	1 = evidence of rain in the last 24 hours	1 = dark	(*eg* 0-5, 5-10 *etc*)
2 = moderate, moves branches	2 = light rain during survey	2 = moderate detail	
3 = strong, impedes progress	3 = heavy rain during survey	3 = bright	

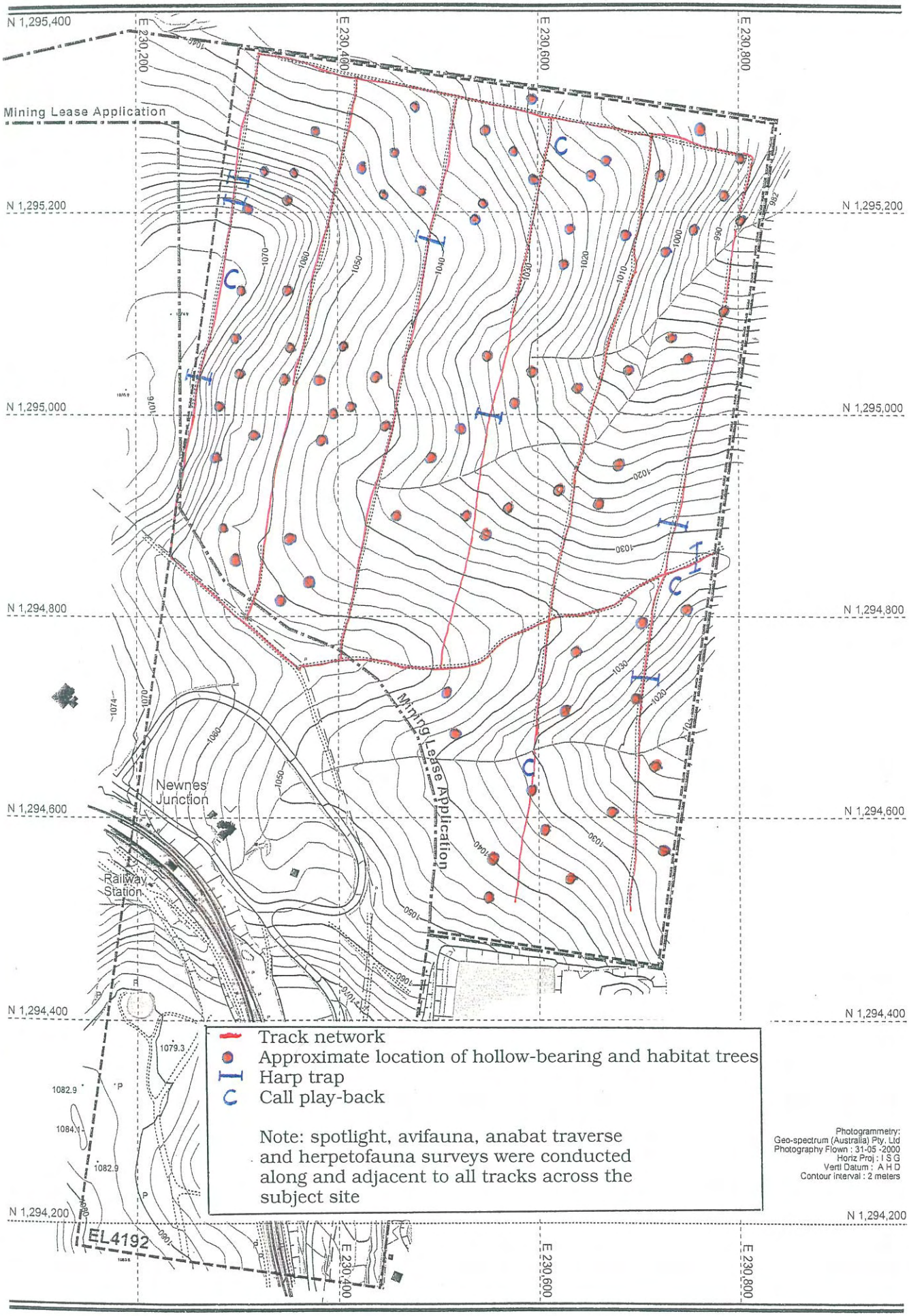


FIGURE 1
Newnes Kaolin Project -Topography

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

APPENDIX F

Combined fauna species list for on the subject site (IEC 2003; P & J Smith 2003; HWR 2004)

APPENDIX F Fauna species recorded on the subject site and in the vicinity.

Key

* Introduced species.

Threatened species as listed in the *NSW Threatened Species Conservation Act 1995*, and the *Environmental Protection and Biodiversity Conservation Act 1999*.

E Endangered
M Migratory Species listed pursuant to the EPBC Act.
V Vulnerable

Survey Key

A Guuninah current survey (2004)
B Smith & Smith (2003) and EIS (IEC 2003)
C Previous surveys in the vicinity (Corkery & Co 1993; IEC 2000)

EPBC Act	TSC Act	COMMON NAME	SCIENTIFIC NAME	A	B	C
		BIRDS				
		Columbidae				
		Common Bronzewing	*Phaps chalcoptera*	✓		
		Crested Pigeon	*Ocyphaps lophotes*	✓		
		Cacatuidae				
		Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	✓	✓	
		Gang-gang Cockatoo	*Callocephalon fimbriatum*	✓	✓	
		Galah	*Cacatua roseicapilla*	✓		
		Sulphur-crested Cockatoo	*Cacatua galerita*	✓		
		Psittacidae				
		Australian King Parrot	*Alisterus scapularis*	✓		✓
		Eastern Rosella	*Platycercus eximius*		✓	✓
		Crimson Rosella	*Platycercus elegans*	✓	✓	
		Aegothelidae				
		Australian Owlet-nightjar	*Aegotheles cristatus*		✓	
		Strigidae				
		Powerful Owl	*Ninox Strenua*			✓
		Southern Boobook	*Ninox novaeseelandiae*	✓		✓
		Podargidae				
		Tawny Frogmouth	*Podargus strigoides*	✓		✓
		Hirundinidae				
		Tree Martin	*Hirundo nigricans*	✓		✓
		Halcyonidae				
		Kookaburra	*Dacelo novaeguineae*	✓	✓	✓
		Sacred Kingfisher	*Halcyon sancta*			✓
		Forest Kingfisher	*Todiramphus macleayii*	✓		
		Megapodiidae				
		Australian Brush-turkey	*Alectura lathami*			✓
		Climacteridae				
		Red-browed Treecreeper	*Climactercis erythrops*		✓	
		White-throated Treecreeper	*Cormobates leucophaeus*	✓	✓	✓
	V	Brown Treecreeper	*Climacteris picumnus*	✓		✓
		Maluridae				
		Superb Fairy-wren	*Malurus cyaneus*	✓		✓
		Variegated Fairy-wren	*Malurus lamberti*	✓	✓	✓
		Pardalotidae				
		Spotted Pardalote	*Pardalotus punctatus*	✓		✓
		White-browed Scrubwren	*Sericornis frontalis*	✓	✓	
		Southern Emu Wren	*Stipiturus malachurus*			✓
		Striated Pardalote	*Pardalotus striatus*			✓
		Weebill	*Smicrornis brevirostris*	✓		

APPENDIX F contd Fauna species recorded on the subject site and in the vicinity.

EPBC Act	TSC Act	COMMON NAME	SCIENTIFIC NAME	A	B	C
		Yellow-rumped Thornbill	*Acanthiza Chrysorrhoa*		✓	✓
		Striated Thornbill	*Acanthiza lineata*	✓	✓	
		Pardalotidae				
		Brown Thornbill	*Acanthiza pusilla*	✓		
		Buff-rumped Thornbill	*Acanthiza reguloides*	✓	✓	
		Meliphagidae				
		Little Wattlebird	*Anthochaera chrysoptera*	✓	✓	✓
		Red Wattlebird	*Anthochaera carunculata*	✓	✓	✓
		Yellow-faced Honeyeater	*Lichenostomus chrysopts*		✓	✓
		New Holland Honeyeater	*Phylidonyris novaehollandiae*	✓	✓	✓
		Brown-headed Honeyeater	*Melithreptus brevirostris*		✓	
		Crested Honeyeater	*Phylidonyris pyrrhoptera*			✓
		White-eared Honeyeater	*Lichenostomus leucotis*	✓	✓	✓
		Niosy Miner	*Manorina melanochephala*		✓	✓
		Bell Miner	*Manorina melanophrys*		✓	
		Eastern Spinebill	*Acanthorhynchus tenuirostris*	✓	✓	✓
		Neosittidae				
		Varied Stittela	*Daphoenositta chrysoptera*	✓	✓	
		Pachycephalidae				
		Grey Shrike-thrush	*Colluricincla harmonica*		✓	
		Petroicidae				
		Scarlet Robin	*Petroica multicolor*	✓		✓
		Eastern Yellow Robin	*Eopsaltria australis*	✓	✓	
		Pomatostomidae				
		White-browed Babbler	*Pomatostomus superciliosus*	✓		
		Cinclosomatidae				
		Eastern Whipbird	*Psophodes olivaceus*	✓		
		Pachycephalidae				
		Golden Whistler	*Pachycephala pectoralis*	✓		✓
		Dicruridae				
		Rufous Fantail	*Rhipidura rufifrons*	✓		
		Satin Flycatcher	*Myiagra cyanoleauca*			✓
		Grey Fantail	*Rhipidura fuliginosa*	✓	✓	✓
		Campephagidae				
		Cicadabird	*Coracina tenuirostris*			✓
		Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	✓		
		Artamidae				
		Australian Magpie	*Gymnorhina tibicen*	✓		✓
		Grey Currawong	*Strepera versicolor*		✓	
		Pied Currawong	*Strepera graculina*	✓	✓	✓
		Corvidae				
		Australian Raven	*Corvus coronoides*	✓	✓	✓
		Corcoracidae				
		White-winged Chough	*Corcorax melanorhamphos*	✓	✓	
		Zosteropidae				
		Silvereye	*Zosterops lateralis*	✓	✓	✓
		MAMMALS				
		Tachyglossidae				
		Short-beaked Echidna	*Tachyglossus aculeatus*	✓		
		Vombatidae				
		Common Wombat	*Vombatus ursinus*	✓	✓	✓
		Petauridae				
		Common Ringtail Possum	*Pseudocheirus peregrinus*	✓	✓	✓
	V	Yellow-bellied Glider	*Petaurus australis*			✓
		Greater Glider	*Petauroides volans*	✓		✓

APPENDIX F contd Fauna species recorded on the subject site and in the vicinity.

EPBC Act	TSC Act	COMMON NAME	SCIENTIFIC NAME	A	B	C
		Phalangeridae				
		Common Brushtail Possum	*Trichosurus vulpecula*	✓		✓
		Macropodidae contd				
		Red-necked Wallaby	*Macropus rufogriseus*	✓		✓
		Swamp Wallaby	*Wallabia bicolor*	✓	✓	✓
		Eastern Grey Kangaroo	*Macropus giganteus*	✓	✓	✓
		Common Wallaroo	*Macropus robustus*			✓
		Dasyuridae				
		Brown Antechinus	*Antechinus stuartii*			✓
		Peramelidae				
		Northern Brown Bandicoot	*Isoodon macrourus*			✓
		Phascolarctidae				
	V	Koala	*Phascolarctos cinereus*			✓
		Muridae				
		New Holland Mouse	*Pseudomys novaehollandiae*			✓
		Bush Rat	*Rattus fuscipes*			✓
		Swamp Rat	*Rattus lutreolus*			✓
		House Mouse*	*Mus musculus*			✓
		Vespertilionidae				
		Gould's Wattled Bat	*Chalinolobus gouldii*			✓
		Chocolate Wattled Bat	*Chalinolobus morio*	✓		
		Lesser Long-eared Bat	*Nyctophilus geoffroyi*	✓		
		Gould's Long-eared Bat	*Nyctophilus gouldi*	✓		
		Little Forest Bat	*Vespadelus Vulturnus*	✓		
		Large Forest Bat	*Vespadelus darlingtonii*	✓		
		Molossidae				
		White-striped Freetail Bat	*Tadarida australis*	✓		✓
		Leporidae				
		Rabbit*	*Oryctolagus cuniculus*	✓		✓
		Canidae				
		Dingo	*Canis familiaris dingo*	✓		✓
		Fox*	*Vulpes vulpes*	✓		✓
		AMPHIBIANS				
		Hylidae				
		Blue Mountains Tree Frog	*Litoria citropa*			✓
		Myobatrachidae				
		Common Eastern Toadlet	*Crinea Signifera*	✓	✓	✓
		Eastern Banjo Frog	*Limnodynastes dumerilii*	✓		
		REPTILES				
		Agamidae				
		Mountain Dragon	*Tympanocryptis diemensis*	✓		✓
		Scincidae				
		Common Bluetongue Lizard	*Tiliqua scincoides*			✓
		Copper-tailed Skink	*Ctenotus taeniolatus*	✓		✓
		-	*Lampropholis delicata*	✓	✓	✓
		-	*Lampropholis guichenoti*	✓		
			Hemiergis decresiensis	✓		
			Acritoscincus duperreyi	✓		
		Red-throated Skink	*Acritoscincus platynotum*	✓		

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

APPENDIX G

Assessments of Significance Pursuant to Section 5A of the EP&A Act

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

APPENDIX G Assessments of Significance pursuant to Section 5A of the *NSW Environmental Planning & Assessment Act 1979.*

1 INTRODUCTION

1.1 General

The NSW *Threatened Species Conservation Act 1995* (TSC Act) has modified the *Environmental Planning & Assessment Act 1979* (EP&A Act) by including *inter alia* a requirement to determine "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*". In this respect, the eight factors of Section 5A (s.5A) of the EP&A Act "*must be taken into account*" by a consent or determining authority when administering sections 78, 79C and 112 of the EP&A Act in the assessment of a *Development Application.*

At the time of preparation of this *Report*, only two threatened species (the Common Bent-wing Bat and Eastern False Pipistrelle) had been recorded from the subject site at Newnes Junction. Two other threatened fauna species (the Koala and the Yellow-bellied Glider) have been recorded from the vicinity and individuals of several other threatened fauna could occur, including several additional threatened microchiropteran bat species. Individuals of some the threatened forest owls known to occur in the Blue Mountains area could also occur on the site.

An Assessment of Significance pursuant to s.5A of the EP&A Act has been prepared for several threatened species which are known to occur or which could potentially utilise the subject site due to the presence of potentially suitable resources. In addition, a s.5A Assessment of Significance has been prepared for the Blue Mountains Water Skink, as this species potentially occurs downslope or downstream. As noted above, only 2 threatened microchiropteran bat species have been recorded on the subject site.

1.2 The Region

In respect of Factor (c) of Section 5A, the TSC Act defines "*region*" as "*a bioregion defined in a national system of bioregionalisation that is determined (by the Director-General by order published in the Gazette) to be appropriate for those purposes*". The Director-General of the NPWS has given notice that the *Interim Biogeographic Regionalisation of Australia* (IBRA), published by the Australian Nature Conservation Agency (now the Department of the Environment & Heritage), is the appropriate definition of "*region*" for the TSC Act (Government Gazette No 65 - 24 May 1996).

On the basis of the IBRA, the site is located in the Sydney Basin Bioregion, which stretches from Batemans Bay in the south to Port Stephens in the north and west as far as Mudgee. The Sydney Basin Bioregion occupies an area of approximately 40,000km^2, a substantial proportion of which is protected within extensive conservation reserves.

The subject site constitutes only a minute proportion of the bushland vegetation and habitats which are present within the Sydney Basin Bioregion and in the general locality. The Greater Blue Mountains Area (GBMA) World Heritage Area occupies in excess of 1 million hectares (or 10,000km^2), and there are further substantial areas of conserved bushland within the Sydney Basin Bioregion. By contrast, the subject site occupies just 25 hectares (or 0.25km^2).

2 FACTORS for CONSIDERATION

Common Bent-wing Bat	**Vulnerable**

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The Common Bent-wing Bat roosts in caves and man-made structures, and has a distribution through eastern Australia (within about 300-400km of the coast). This species forages through and above the forest canopy, and is regularly recorded in modified environments, including urban areas. There are no suitable roosting or breeding resources are present on the subject site at Newnes, but the forest canopy provides a suitable foraging environment.

However, the subject site at Newnes constitutes only a minute proportion of the contiguous forest habitats available for foraging by the Common Bent-wing Bat in this general area. The GBMA World Heritage Area includes over 1 million hectares of conserved and protected forest and woodland, and

extensive areas of roosting resources for this species. The subject site by contrast occupies just 25 hectares.

It is not conceivable that a "*viable local population*" of this highly mobile and wide-ranging bat would be reliant on the subject site at Newnes or would be restricted to it.
It is not likely that the "*life cycle*" of the Common Bent-wing Bat would be "*disrupted*" by the proposed development, nor is it likely that a "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed mining operation at Newnes.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

The TSC Act defines an "*endangered population*" as "*a population specified in Part 2 of Schedule 1*" of the Act.

There is no listed "*endangered population*" of the Common Bent-wing Bat.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

The subject site occupies only a minute proportion of the available habitat for the Common Bent-wing Bat within the region, particularly in respect of the "*regional distribution*", and the considerable protection, of that habitat. As noted above, the subject site occupies just 25ha whilst conserved lands in the region, containing suitable habitat, occupy considerably in excess of one million hectares.

The proposed mining operation at Newnes will not involve "*a significant area of known habitat*" being "*modified or removed*", in respect either of the local or the "*regional distribution of the habitat*" (emphasis added) for the Common Bent-wing Bat.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

The Common Bent-wing Bat is a highly mobile and wide-ranging species, capable of travelling over considerable distances in an evening of foraging. Furthermore, this species readily utilises and/or traverses areas of high disturbance.

Substantial areas of potential habitat for this species are present in the extensive conservation reserves in the vicinity. In this regard, the GBMA World Heritage Area occupies an area of bushland in excess of one million hectares, and there are extensive other areas of conserved lands in the region.

The proposed mining operation is located at the edge of the extensive conservation reserves in the locality. The proposal will not result in the isolation of "*currently interconnecting or proximate areas of habitat*" for the Common Bent-wing Bat.

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under Part 3*" of the Act.

At the time of preparation of this *Report*, no "*critical habitat*" had been declared by the Director-General of the NPWS for the Common Bent-wing Bat.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

There are insufficient data to determine whether or not the Common Bent-wing Bat is "*adequately represented in conservation reserves (or other similar protected areas) in the region*". Further, despite the vast areas of conservation reserves in the Sydney Basin Bioregion, it can be assumed (on the basis

of pure logic alone) that this species is not "*adequately represented in conservation reserves*". If it was "*adequately represented*" (emphasis added) in such reserves, it presumably would not be "*threatened*".

Regardless of whether the Common Bent-wing Bat is "*adequately represented in conservation reserves in the region*", the proposed mining operation at Newnes will not affect the adequacy of conservation of this species or the extent of habitat protected in conservation reserves.

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation.

The mine proposal at Newnes will require the clearing of an area of "*native vegetation*" as defined in the *Final Determination* for the "*clearing of native vegetation*" (listed as a "*key threatening process*"). However, that removal will not involve the loss of significant areas of potential foraging habitat for the Common Bent-wing Bat from the subject site, and involves no loss of roosting resources.

The substantial extent of adjoining conservation reserves, and the limited resources for the species on the site, preclude the proposed mine at Newnes from constituting an action that could conceivably "*threaten*" the "*survival or evolutionary development*" of the Common Bent-wing Bat.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

The Common Bent-wing Bat is not "*at the limited of its known distribution*" on the site at Newnes Junction.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in the determination of "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed in detail above with respect to the Common Bent-wing Bat. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

Given the high mobility of the Common Bent-wing Bat and the extent of available (protected) resources in the area, the proposed mining operations at Newnes will not involve the imposition of "*a significant effect*" on this species.

Eastern False Pipistrelle	**Vulnerable**

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The Eastern False Pipistrelle roosts in tree-hollows, caves and occasionally old buildings (Churchill 1998), and has a distribution through southeastern Australia (within about 300km of the coast). This species forages through and just below the forest canopy, in *"schlerophyll forests from the Great Dividing Range to the coast*" (Churchill 1998).

Whilst the subject site at Newnes provides both foraging and roosting resources for the Eastern False Pipistrelle, constitutes only a minute proportion of the contiguous forest habitats available for this species in this general area. The GBMA World Heritage Area includes over 1 million hectares of

conserved and protected forest and woodland, and extensive areas of roosting resources for this species. The subject site by contrast occupies just 25 hectares.

It is not conceivable that a "*viable local population*" of this highly mobile species would be reliant on the subject site at Newnes or would be restricted to it.

Further, is not likely that the "*life cycle*" of the Eastern False Pipistrelle would be "*disrupted*" by the proposed development, nor is it likely that a "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed mining operation at Newnes.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

The TSC Act defines an "*endangered population*" as "*a population specified in Part 2 of Schedule 1*" of the Act.

There is no listed "*endangered population*" of the Eastern False Pipistrelle.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

The subject site occupies only a minute proportion of the available habitat for the Eastern False Pipistrelle within the region, particularly in respect of the "*regional distribution*", and the considerable protection, of that habitat. As noted above, the subject site occupies just 25ha whilst conserved lands in the region, containing suitable habitat, occupy considerably in excess of one million hectares.

The proposed mining operation at Newnes will not involve "*a significant area of known habitat*" being "*modified or removed*", in respect either of the local or the "*regional distribution of the habitat*" (emphasis added) for the Eastern False Pipistrelle.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

The Eastern False Pipistrelle is a highly mobile and wide-ranging species, capable of travelling over considerable distances (at least 12km - Churchill 1998) in an evening of foraging. Substantial areas of potential habitat for this species are present in the extensive conservation reserves in the vicinity. In this regard, the GBMA World Heritage Area occupies an area of bushland in excess of one million hectares, and there are extensive other areas of conserved lands in the region.

The proposed mining operation is located at the edge of the extensive conservation reserves in the locality. The proposal will not result in the isolation of "*currently interconnecting or proximate areas of habitat*" for the Eastern False Pipistrelle.

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under Part 3*" of the Act.

At the time of preparation of this *Report*, no "*critical habitat*" had been declared by the Director-General of the NPWS for the Eastern False Pipistrelle.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

There are insufficient data to determine whether or not the Eastern False Pipistrelle is "*adequately represented in conservation reserves (or other similar protected areas) in the region*". Further, despite the vast areas of conservation reserves in the Sydney Basin Bioregion, it can be assumed (on the basis

of pure logic alone) that this species is not "*adequately represented in conservation reserves*". If it was "*adequately represented*" (emphasis added) in such reserves, it presumably would not be "*threatened*".

Regardless of whether the Eastern False Pipistrelle is "*adequately represented in conservation reserves in the region*", the proposed mining operation at Newnes will not affect the adequacy of conservation of this species or the extent of habitat protected in conservation reserves.

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation.

The mine proposal at Newnes will require the clearing of an area of "*native vegetation*" as defined in the *Final Determination* for the "*clearing of native vegetation*" (listed as a "*key threatening process*"). However, that removal will not involve the loss of significant suitable habitat for the Eastern False Pipistrelle from the subject site, and involves no loss of roosting resources.

The substantial extent of adjoining conservation reserves, and the limited resources for the species on the site, preclude the proposed mine at Newnes from constituting an action that could conceivably "*threaten*" the "*survival or evolutionary development*" of the Eastern False Pipistrelle.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

The Eastern False Pipistrelle is not "*at the limited of its known distribution*" on the site at Newnes Junction.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in the determination of "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed in detail above with respect to the Eastern False Pipistrelle. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

Given the high mobility of the Eastern False Pipistrelle and the extent of available (protected) resources in the area, the proposed mining operations at Newnes will not involve the imposition of "*a significant effect*" on this species.

Other Microchiropteran Bats

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The other threatened microchiropteran bats which could or may occur on the subject site include a suite of species which utilise tree-hollows for shelter and roosting and other species which predominantly use caves and tunnels. In the case of the latter suite of species, no roosting or breeding resources are present on the subject site at Newnes. For the tree-hollow dependent suite of microchiropteran bats, however, there are suitable roosting resources present.

The subject site at Newnes constitutes only a minute proportion of the contiguous habitats and resources available for microchiropteran bats in this general area. The GBMA World Heritage Area includes over 1 million hectares of conserved and protected forest and woodland, and other suitable resources for microchiropteran bats. The subject site by contrast occupies just 25 hectares.

It is not conceivable that a "*viable local population*" of any microchiropteran bat species would be reliant on the subject site at Newnes or would be restricted to it. As a consequence, it is not possible for any such "*population*", even if present, being "*placed at risk of extinction*" as a result of disturbance to, or the clearing and mining of most of the site.

Further, it is not likely that the "*life cycle*" of any microchiropteran bat species would be "*disrupted*" by the proposed development such as to place a "*viable local population*" of any such species would be "*placed at risk of extinction*".

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

The TSC Act defines an "*endangered population*" as "*a population specified in Part 2 of Schedule 1*" of the Act.

There is no listed "*endangered population*" of any microchiropteran bat species.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

The subject site occupies only a minute proportion of the available habitat for these species within the region, particularly in respect of the "*regional distribution*", and the considerable protection, of that habitat. As noted above, the subject site occupies just 25ha whilst conserved lands in the region, containing suitable habitat, occupy considerably in excess of one million hectares.

The proposed mining operation at Newnes will not involve "*a significant area of known habitat*" for any microchiropteran bat species being "*modified or removed*", in respect either of the local or the "*regional distribution of the habitat*" (emphasis added) for these species.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

Microchiropteran bats are generally highly mobile and wide-ranging species, capable of travelling over considerable distances in an evening of foraging. Furthermore, many such species utilise and/or traverse areas of high disturbance.

Substantial areas of potential habitat for these species are present in the extensive conservation reserves in the vicinity. In this regard, the GBMA World Heritage Area occupies an area of bushland in excess of one million hectares, and there are extensive other areas of conserved lands in the region.

The proposed mining operation is located at the edge of the extensive conservation reserves in the locality. The proposal will not result in the isolation of "*currently interconnecting or proximate areas of habitat*" for any microchiropteran bat species.

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under Part 3*" of the Act.

At the time of preparation of this *Report*, no relevant "*critical habitat*" had been declared by the Director-General of the NPWS for any threatened microchiropteran bats.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

There are insufficient data to determine whether or not any of the threatened microchiropteran bats which do or may occur on the subject site is "*adequately represented in conservation reserves (or other similar protected areas) in the region*". Further, despite the vast areas of conservation reserves in the Sydney Basin Bioregion, it can be assumed (on the basis of pure logic alone) that none of the species

of microchiropteran bats which are listed as "*threatened*" would be "*adequately represented in conservation reserves*". If any such species were "*adequately represented*" (emphasis added) in such reserves, they presumably would not be "*threatened*".

Regardless of whether any microchiropteran bat species, or their habitats, are "*adequately represented in conservation reserves in the region*", the proposed mining operations at Newnes will not affect the adequacy of conservation of these species or the extent of habitat protected in conservation reserves.

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation.

The mine proposal at Newnes does involve the clearing of an area of "*native vegetation*" as defined in the *Final Determination* for the "*clearing of native vegetation*" (listed as a "*key threatening process*"). However, that removal will not involve the loss of significant areas of potential foraging or roosting habitat for any threatened microchiropteran bats from the subject site, and involves no loss of "*known habitat*" for such species.

The substantial extent of adjoining conservation reserves precludes the proposed mine at Newnes from constituting an action that could conceivably "*threaten*" the "*survival or evolutionary development*" of any threatened microchiropteran bats.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

None of the threatened microchiropteran bat species known or likely to occur on the site at Newnes Junction is "*at the limit of its known distribution*".

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in the determination of "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed in detail above with respect to the microchiropteran bat species known to occur in the locality. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

Given the high mobility of these species and the extent of available (protected) resources in the area, the proposed mining operations at Newnes will not involve the imposition of "*a significant effect*" on any threatened microchiropteran bat species.

Yellow-bellied Glider *Petaurus australis*	**Vulnerable**

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The Yellow-bellied Glider is an arboreal mammal that inhabits the moist and dry sclerophyll forests and woodlands of southeastern Australia (Strahan 1995). This species has been recorded in the vicinity, but not on the subject site at Newnes. No indirect evidence for the Yellow-bellied Glider (*eg* characteristic feed trees or dens) was obtained from the subject site, but individuals could use the site for foraging.

Even if present on the site at Newnes, however, there is no likelihood that a "*viable local population*" of the Yellow-bellied Glider would be "*placed at risk of extinction*" by the proposed mining activity. Given the considerable extent of conservation reserves in the locality and region, and the lack of evidence for use of the site by the Yellow-bellied Glider, is not likely that the "*life cycle*" of the species would be "*disrupted*" by the proposed activity at Newnes to any significant extent, if at all.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

An "*endangered population*" is defined in the TSC Act as "*a population specified in part 2 of Schedule 1*" of the Act.

There is no listed "*endangered population*" of the Yellow-bellied Glider.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

The "*regional distribution*" of the Yellow-bellied Glider within the Sydney Basin Bioregion includes a range of locations along the NSW coast, east of the Great Dividing Range (Maxwell *et al* 1996). The subject site represents a sufficient area only for one family group of the Yellow-bellied Glider, if it used by the species at all.

Given the small area of habitat on the subject site and the substantial area of adjoining conservation reserves, the site cannot be construed as constituting "*a significant area of known habitat*" for the Yellow-bellied Glider. The proposal will therefore not involve the modification or removal of "*a significant area of known habitat*" in respect of either the local or "*the regional distribution of the habitat*" (emphasis added) for the Yellow-bellied Glider.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

The subject site is located at the periphery of 'potential' habitat for the Yellow-bellied Glider, with very substantial areas of forest located to the north and east. The proposed mine development will not compromise any connectivity of habitat for the Yellow-bellied Glider, and will not isolate any areas of either potential or "*known*" habitat "*from currently interconnecting or proximate areas of habitat*" for this species.

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under part 3*" of the Act.

At the time of this *Report*, no "*critical habitat*" for the Yellow-bellied Glider had been declared by the Director-General of NPWS.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

It is not considered likely that the Yellow-bellied Glider is "*adequately represented in conservation reserves (or other similar protected areas) in the region*". If it were "*adequately represented*", (emphasis added), it presumably would not be "*threatened*".

Irrespective of the adequacy or otherwise of representation of the Yellow-bellied Glider in conservation or other reserves, the proposed activity will not adversely affect the conservation status of this species or the extent of conservation of its habitat.

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*".

Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

The Yellow-bellied Glider is not at the "*limit of its known distribution*" on the subject site.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in the determination of "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed in detail above with regard to the Yellow-bellied Glider. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

On the basis of the above considerations, the proposed mine on the subject site at Newnes is not "*likely*" to impose "*a significant effect*" on the Yellow-bellied Glider. A *Species Impact Statement* (SIS) is not required with respect to this species in relation to the proposed development at Newnes.

Red-crowned Toadlet ***Pseudophryne australis***	**Vulnerable**

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The Red-crowned Toadlet is restricted in its distribution to sandstone landscapes of the Greater Sydney Metropolitan district, between Newcastle in the north, Barren Grounds in the south, and Mount Victoria in the west. This species occupies the small ephemeral watercourses and drainage lines in the upper catchments and along sandstone escarpments and ridgelines, particularly in the "*very small drainage lines called "feeder creeks" which feed runoff water from the ridges to the perennial creeks below or in areas of seepage*" (Ehmann 1997). Red-crowned Toadlets utilise the depressions in these 'feeder creeks', where rock and leaf litter provide moist conditions both for shelter and for breeding. This species does not use permanent ponds for breeding, and "*the water bodies in which the tadpoles develop are only small puddles or depressions where either rock or leaf litter and twig drift hold back the water temporarily*" (Ehmann 1997).

Adult frogs are reported to feed primarily on ants and termites (Wotherspoon 1998), although it is likely that they take other insects and invertebrates as well (Smith & Smith 2000). Tadpoles feed in water on plant material and detritus (Smith & Smith 2000).

The Red-crowned Toadlet has not been recorded on the subject site at Newnes. Whilst there are records of the species in the locality (NPWS Wildlife Atlas), and the Blue Mountains area is a focus for this species, the subject site supports little suitable habitat for this species.

The Red-crowned Toadlet has not been recorded on the subject site at Newnes, and the site provides only limited marginal habitat for this species. Considerable areas of suitable habitat are present in the substantial conservation reserves in the locality and region. It is not "*likely*" that the proposed mining development would cause "*a viable local population*" of the Red-crowned Toadlet "*to be placed at risk of extinction*", even if such a "*population*" is present on the site and on adjoining lands.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

An "*endangered population*" is defined in the TSC Act as "*a population specified in Part 2 of Schedule 1*" of the Act.

There is no "*endangered population*" of the Red-crowned Toadlet.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

The Sydney Basin Region contains all of the "*known habitat*" of the Red-crowned Toadlet. As noted above, the Blue Mountains area constitutes a focus for the Red-crowned Toadlet, with substantial numbers of records of the species in this area.

There are vast areas of suitable habitat for the Red-crowned Toadlet in the extensive conservation reserves in the locality and region. The subject site cannot be construed as comprising "*a significant area of known* [or indeed even potential] *habitat*" in respect of "*the regional distribution of the habitat*" (emphasis added) for the Red-crowned Toadlet.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

The proposed mining activity on the subject site at Newnes will not isolate any areas of habitat for the Red-crowned Toadlet "*from currently interconnecting or proximate areas of habitat*". The site would be located at the periphery of 'potential' (not "*known*") habitat, and there are vast areas of suitable habitat nearby.

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under Part 3*" of the Act.

At the time of preparation of this *Report*, no "*critical habitat*" for the Red-crowned Toadlet had been declared by the Director-General of the NPWS.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

The Red-crowned Toadlet is well represented in conservation reserves within its limited distribution, including Ku-ring-gai Chase, Marramarra, Blue Mountains, Dharug, Wollemi, Sydney Harbour, Lane Cove, Royal and Garigal National Parks, and Barren Grounds Nature Reserve (Ehmann 1997). It has also been recorded in a number of State Forests, Sydney Water catchments and on Council reserves and lands (Ehmann 1997). Furthermore, the subject site is located adjacent to the million hectares plus of the Greater Blue Mountains Area (GBMA) World Heritage Area, which supports extensive suitable habitat for the species.

Consequently, it is considered that the Red-crowned Toadlet is "*adequately represented in conservation reserves (or other similar protected areas) in the region*".

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation.

Whilst the proposed mine at Newnes will require the "*Clearing of Native Vegetation*" (which is listed as a "*key threatening process*"), only a small area of potential (albeit marginal) habitat for the Red-crowned Toadlet will be affected. The proposed mine at Newnes could not conceivably "*threaten*" the "*survival or evolutionary development*" of the Red-crowned Toadlet, given the substantial areas of suitable habitat in the extensive conservation reserves in the general locality and region which support abundant suitable habitat for this species.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

The Red-crowned Toadlet is not at "*the limit of its known distribution*" on the subject site at Newnes.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in determining "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed above with respect to the Red-crowned Toadlet. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

Given the lack of any evidence for the species on the site, the marginal value (at best) of the proposed mine area for the species, and the extent of habitat in the substantial conservation reserves in the locality and region, it is not "*likely*" that the activity could involve the imposition of "*a significant effect*" on the Red-crowned Toadlet.

A *Species Impact Statement* is not required for the proposed development at Newnes with respect to the Red-crowned Toadlet.

Threatened Forest Owls

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The large forest owls occupy extremely large home ranges (up to 1000ha for a single pair), and the subject site could therefore at best constitute only a very small proportion of the home range for a single pair of any of these species. Furthermore, there are considerable areas of suitable habitat for the large forest owls in the extensive conservation reserves in the GBMA World Heritage Area (which exceed 1 million hectares). Consequently, even if the subject site is used by any such species, it could not be regarded as constituting "*a significant area of known habitat*" for any of the large forest owls.

The subject site could not be significant in the survival of even a single pair of any of the large forest owl species. It is not "*likely*" that the proposed development of the subject site would cause "*a viable local population*" (or even individuals) of any of the forest owls "*to be placed at risk of extinction*", or indeed to be adversely affected to any significant extent at all.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

An "*endangered population*" is defined in the TSC Act as "*a population specified in part 2 of Schedule 1*" of the Act.

There is no "*endangered population*" of any of the threatened forest owl species.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

Given the substantial area of forest and woodland present in the adjoining conservation reserves (in excess of one million hectares), and the extremely small area of the site compared to the home ranges of the relevant species, the subject site cannot be construed as comprising "*a significant area of known habitat*" in respect of "*the regional distribution of the habitat*" (emphasis added) for any of the forest owl species.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

Given the high mobility of these species, and the extent of conservation habitat and resources in the vicinity, the proposed mining activity will not result in any habitat or resources for the large forest owls becoming "*isolated from currently interconnecting or proximate areas of habitat*".

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under Part 3*" of the Act.

At the time of preparation of this *Report,* no "*critical habitat*" had been declared by the Director-General of the NPWS for any of the large forest owls.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

It is not likely that any of the large forest owls would be considered "*adequately represented in conservation reserves (or other similar protected areas) in the region*". Conversely, the Sydney Basin Bioregion contains very substantial areas of "*conservation reserves (or other similar protected areas*)", and it is possible that the large forest owls are in fact "*adequately*" conserved in this region.

The proposed mining operation at Newnes will not adversely affect the conservation status of any of the threatened forest owl species or their habitats in the locality or "*region*", because of the extent of resources available in the conservation reserves in the region and the mobility and extent of home ranges of these species.

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*".

Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation. Whilst mining *per se* is not listed as a "*key threatening process*" in Schedule 3 of the TSC Act, the "*clearing of native vegetation*" has been listed as a "*key threatening process*".

The proposed mining operation at Newnes could not conceivably "*threaten*" the "*survival or evolutionary development*" of any of the relevant forest owl species. There are no suitable nesting resources within the mine area, and there are substantial areas of suitable habitat in the general locality and region, protected within the "*vast*" conservation reserves in the Greater Blue Mountains Area.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

No threatened forest owl is at "*the limit of its known distribution*" in the vicinity the subject site at Newnes.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in determining "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed in detail above with respect to the threatened forest owls. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

Given the extent of suitable habitat for the forest owls in the vicinity, the small area of habitat (relatively) on the site, the lack of nesting resources and the extent of adjoining conservation reserves, it cannot be considered "*likely*" that the proposed mining activity will involve the imposition of "*a significant effect*" on any threatened forest owl species.

Blue Mountains Water Skink *Eulamprus leuraensis*	**Endangered**

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The Blue Mountains Water Skink is restricted in its distribution to the swamps and wetlands of the Blue Mountains area, west of Sydney. This species utilises "*an isolated and naturally fragmented habitat of sedge and shrub swamps (Keith & Benson 1988) that have boggy soils and appear to be permanently wet (LeBreton, 1996)*" (NPWS 2000).

The Blue Mountains Water Skink has not been recorded on the subject site at Newnes despite dedicated surveys (Biosphere 2003, 2004; Gunninah 2004). Whilst there is a record of the species in the vicinity (Dr A White *pers comm*), the subject site does not contain suitable habitat for the Blue Mountains Water Skink (Biosphere 2004). There is, however, potential habitat for the species downstream.

The Blue Mountains Water Skink has not been recorded on the subject site at Newnes, and the site does not provide suitable habitat for this species. Significant areas of potentially suitable habitat are present in the vicinity and in the substantial conservation reserves in the locality and region.

Given those circumstances, it is not "*likely*" that the proposed mining operations would cause "*a viable local population*" of the Blue Mountains Water Skink "*to be placed at risk of extinction*".

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

An "*endangered population*" is defined in the TSC Act as "*a population specified in Part 2 of Schedule 1*" of the Act.

There is no "*endangered population*" of the Blue Mountains Water Skink.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

The Sydney Basin Bioregion contains all of the "*known habitat*" of the Blue Mountains Water Skink.

The subject site does not support suitable habitat for the Blue Mountains Water Skink, and the species has not been recorded on the site (Biosphere 2003, 2004; Gunninah 2004). Consequently, the site cannot be construed as comprising "*a significant area of known habitat*" (emphasis added) for this species. Even were the Blue Mountains Water Skink to occur on the site, the resources present would not constitute a "*significant area of known habitat*" in respect of "*the regional distribution of the habitat*" (emphasis added) for the Blue Mountains Water Skink.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

The proposed mining activity on the subject site at Newnes will not isolate any areas of habitat for the Blue Mountains Water Skink "*from currently interconnecting or proximate areas of habitat*". The site would be located at the periphery of 'potential' (not "*known*") habitat, and the final land form may provide supplementary habitat for this species.

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under Part 3*" of the Act.

At the time of preparation of this *Report*, no "*critical habitat*" for the Blue Mountains Water Skink had been declared by the Director-General of the NPWS.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

The Blue Mountains Water Skink is not likely to be "*adequately represented in conservation reserves (or other similar protected areas) in the region*". This species has only a limited distribution, with many areas of habitat not located within such reserves.

Conversely, the proposed mining operations at Newnes will not adversely affect the conservation status of the species or the representation of either the species or its habitat in conservation reserves "*in the region*".

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation.

Whilst the proposed mine will require the "*clearing of native vegetation*" (listed as a "*key threatening process*"), no suitable habitat for the Blue Mountains Water Skink will be affected. Furthermore, potential habitat downstream will be protected by appropriate measures.

Consequently, the proposed mine is not likely to "*threaten*" the "*survival or evolutionary development*" of the Blue Mountains Water Skink. The activity is not therefore a "*threatening process*" as defined in the Act.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

The Blue Mountains Water Skink is not likely to be at "*the limit of its known distribution*" on the subject site at Newnes, despite the small extent of its distribution.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in determining "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed above with respect to the Blue Mountains Water Skink. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

Given the lack of any evidence for the species on the site, the lack of suitable habitat on the site, and the extent of potentially suitable habitat in adjoining conservation reserves, it is not "*likely*" that the activity would involve the imposition of "*a significant effect*" on the Blue Mountains Water Skink.

A *Species Impact Statement* is not required for the proposed development at Newnes with respect to the Blue Mountains Water Skink.

Koala *Phascolarctos cinereus*	**Vulnerable Species**

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The Koala utilises the tree canopy in open forests and woodlands in eastern Australia, and has been recorded in the vicinity, but not on the subject site at Newnes. Additionally, no indirect evidence for the Koala (its characteristic scats) has been obtained from the subject site, although individuals could potentially use the site for foraging.

Even if present on the site at Newnes, however, there is no likelihood that a "*viable local population*" of the Koala would be "*placed at risk of extinction*" by the proposed mining activity. Given the extent of

conservation reserves in the locality and region, and the limited value of the site for the Koala, it is not likely that the "*life cycle*" of this species would be "*disrupted*" by the proposed activity at Newnes to any significant extent, if at all.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

An "*endangered population*" is defined in the TSC Act as "*a population specified in part 2 of Schedule 1*" of the Act.

There is no listed "*endangered population*" of the Koala.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

The "*regional distribution*" of the Koala within the Sydney Basin Bioregion includes a number of scattered disjunct coastal sites, and rare inland sites. The subject site represents suitable habitat for only a few individuals of the Koala, if it used by the species at all.

Given the small area of habitat on the subject site and the substantial area of adjoining conservation reserves, the site cannot be construed as constituting "*a significant area of known habitat*" for the Koala. The proposal will therefore not involve the modification or removal of "*a significant area of known habitat*" in respect of either the local or "*the regional distribution of the habitat*" (emphasis added) for the Koala.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

The subject site does not constitute an area of "*known habitat*" for the Koala.

The proposed mine development will not compromise any connectivity of habitat for the Koala, and will not isolate any areas of either potential or "*known*" habitat "*from currently interconnecting or proximate areas of habitat*" for this species.

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under part 3*" of the Act.

At the time of this *Report*, no "*critical habitat*" for the Koala had been declared by the Director-General of NPWS.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

It is not considered likely that the Koala is "*adequately represented in conservation reserves (or other similar protected areas) in the region*". If it were "*adequately represented*" (emphasis added), it presumably would not be "*threatened*".

Irrespective of the adequacy or otherwise of representation of the Koala in conservation or other reserves, the proposed activity will not adversely affect the conservation status of this species or the extent of conservation of its habitat.

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation.

The mine proposal at Newnes does involve the clearing of an area of "*native vegetation*" as defined in the *Final Determination* for the "*clearing of native vegetation*" (listed as a "*key threatening process*"). However, that removal will not involve the loss of habitat for the Koala from the subject site.

The proposed mine operation could not conceivably "*threaten*" the "*survival or evolutionary development*" of the Koala, and is not therefore a "*threatening process*" as defined in the Act.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

The Koala is not at the "*limit of its known distribution*" on the subject site.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in the determination of "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed in detail above with regard to the Koala. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

On the basis of the above considerations, the proposed mine on the subject site at Newnes is not "*likely*" to impose "*a significant effect*" on the Koala. A *Species Impact Statement* (SIS) is not required with respect to this species in relation to the proposed development at Newnes.

Tiger Quoll *Dasyurus macluatus*	**Vulnerable**

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The Tiger Quoll utilises a range of forested environments and habitats, and is typically associated with the denser moist forest environments along watercourses and drainage lines. However, this species is highly adaptable and has also been recorded in small bushland remnants in urban Sydney and on the periphery of urban environment. It is also know to traverse urban areas on occasions.

Even if present on the site at Newnes, there is no likelihood that a "*viable local population*" of the Tiger Quoll would be "*placed at risk of extinction*" by the proposed mining activity. There are considerable conservation reserves in the immediate vicinity, locality and region, containing suitable habitat for this species.

It is not likely that the "*life cycle*" of the Tiger Quoll would be "*disrupted*" by the proposed activity at Newnes to any significant extent, if at all.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

An "*endangered population*" is defined in the TSC Act as "*a population specified in part 2 of Schedule 1*" of the Act.

There is no listed "*endangered population*" of the Tiger Quoll.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

The "*regional distribution*" of the Tiger Quoll within the Sydney Basin Bioregion includes essentially all of the forested portions of the Region. The subject site represents only an extremely small area of potential (not "*known*") habitat for the species "*in relation to the regional distribution of the habitat*".

Given the small area of habitat on the subject site and the substantial area of adjoining conservation reserves, the site cannot be construed as constituting "*a significant area of known habitat*" for the Tiger Quoll. The proposal will not involve the modification or removal of "*a significant area of known habitat*" in respect of either the local or "*the regional distribution of the habitat*" (emphasis added) for the Tiger Quoll.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

The Tiger Quoll is highly adaptable species which utilises urban as well as forested environments. Given its mobility and adaptability, the proposed mine development will not compromise any connectivity of habitat for the Tiger Quoll, and will not isolate any areas of either potential or "*known*" habitat "*from currently interconnecting or proximate areas of habitat*" for this species.

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under part 3*" of the Act.

At the time of this *Report*, no "*critical habitat*" for the Tiger Quoll had been declared by the Director-General of NPWS.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

It is not considered likely that the Tiger Quoll is "*adequately represented in conservation reserves (or other similar protected areas) in the region*". If it were "*adequately represented*" (emphasis added), it presumably would not be "*threatened*".

Irrespective of the adequacy or otherwise of representation of the Tiger Quoll in conservation or other reserves, the proposed activity will not adversely affect the conservation status of this species or the extent of conservation of its habitat.

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation.

The mine proposal at Newnes does involve the clearing of an area of "*native vegetation*" as defined in the *Final Determination* for the "*clearing of native vegetation*" (listed as a "*key threatening process*"). However, that removal will not involve the loss of significant areas of potential habitat for the Tiger Quoll.

The substantial extent of adjoining conservation reserves precludes the proposed mine from constituting an action that could conceivably "*threaten*" the "*survival or evolutionary development*" of the Tiger Quoll. The proposed mining operation is not therefore a "*threatening process*" as defined in the Act.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

The Tiger Quoll is not at the "*limit of its known distribution*" on the subject site.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in the determination of "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed in detail above with regard to the Tiger Quoll. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

On the basis of the above considerations, the proposed mine on the subject site at Newnes is not "*likely*" to impose "*a significant effect*" on the Tiger Quoll. A *Species Impact Statement* (SIS) is not required with respect to this species in relation to the proposed development at Newnes.

Threatened Plants

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

A range of threatened plant species have been identified as occurring in the general locality or potentially occurring on the site at Newnes. However, no records of any threatened plant species have been recorded from the site, despite investigations by a number of individual biologists. Nevertheless, a number of threatened plant species are known to occur on the dry sclerophyll ridges of the Blue Mountains, and individuals or small populations of such species could potentially occur on the subject site.

Even if any such individuals or populations were present, however, it is not likely that the site constitutes an isolate or an area of 'critical' habitat for the long-term viability of any such species. It cannot be regarded as likely that any threatened plant species would be restricted to the subject site at Newnes.

The subject site is not likely to be significant for any threatened plant species, given the absence of records for any such species and the lack of restricted or 'critical' habitat or resources. It is not "*likely*" that the proposed development of the subject site would cause "*a viable local population*" of any threatened plant species "*to be placed at risk of extinction*", if any such species is present.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised

An "*endangered population*" is defined in the TSC Act as "*a population specified in part 2 of Schedule 1*" of the Act.

There is no relevant listed "*endangered population*" of any plant species.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

Given the substantial area of forest and woodland present in the adjoining conservation reserves, and the extremely small area of the site in comparison, the subject site cannot regarded as likely to as comprise "*a significant area of known habitat*" for any threatened plant species. The habitats present are not restricted or of particular significance, and are well represented in the extensive adjoining reserves.

The site cannot be regarded as constituting "*a significant area*" of habitat ("*known*" or potential) for any threatened plant species in respect of "*the regional distribution of the habitat*" (emphasis added) for these species.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

Given the extent of conservation of the relevant habitats and resources in the vicinity, locality and region, and the circumstances and context of the site, the proposed mining activity at Newnes will not result in any habitat or resources for threatened plant species becoming "*isolated from currently interconnecting or proximate areas of habitat*".

(e) whether critical habitat will be affected

The TSC Act defines "*critical habitat*" as "*habitat declared to be critical habitat under Part 3*" of the Act.

At the time of preparation of this *Report,* no relevant "*critical habitat*" had been declared by the Director-General of the NPWS for any of the threatened plant species of potential concern.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

It is not likely that any of the threatened plant species would be considered "*adequately represented in conservation reserves (or other similar protected areas) in the region*". Conversely, the Sydney Basin Bioregion contains very substantial areas of "*conservation reserves (or other similar protected areas*)", and it is possible that many of the so-called threatened plant species are in fact "*adequately*" conserved in this region.

The proposed mining operation at Newnes will not adversely affect the conservation status of any of the threatened plant species or their habitats in the locality or "*region*", because of the extent of resources available in the conservation reserves in the region.

(g) whether the development or activity is of a class of development or activity that is recognised as a threatening process

The TSC Act defines "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*".

Schedule 3 of the TSC Act provides a list of the "*key threatening processes*" which are regarded as of relevance to the Act and its implementation. Whilst mining *per se* is not listed as a "*key threatening process*" in Schedule 3 of the TSC Act, the "*Clearing of Native Vegetation*" has been listed as a "*key threatening process*".

The proposed mining operation at Newnes would not "*threaten*" the "*survival or evolutionary development*" of any of the potentially relevant threatened plant species. There are no habitats or resources of restricted distribution or critical value within the mine area, and there are substantial areas of suitable habitat in the general locality and region, protected within the substantial conservation reserves in the Greater Blue Mountains Area.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution

No threatened plant species is at "*the limit of its known distribution*" in the vicinity the subject site at Newnes.

CONCLUSION

The eight factors which are required to be considered pursuant to s.5A of the EP&A Act in determining "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*" are discussed in detail above with respect to threatened plant species. Other relevant factors (*eg* the extent of conservation reserves in the immediate vicinity, general locality and region, and the total distribution of the species) have also been taken into the account in considering s.5A of the EP&A Act.

Given the extent of suitable habitat for threatened plants in the vicinity, locality and region, the small area of habitat (relatively) on the site, and the lack of critical resources present, it cannot be considered "*likely*" that the proposed mining activity will involve the imposition of "*a significant effect*" on any threatened plant species.

Proposed Sand Extraction & Kaolin Mine
Newnes Junction

Supplementary Submission to DIPNR

Flora & Fauna Issues

APPENDIX H

The Greater Blue Mountains Area (GBMA) World Heritage Area

Gunninah Environmental Consultants
PO Box 513 Crows Nest NSW 1585
ph: 02 - 9906 5436 fax: 02 - 9906 7770 email: gecon@gunninah.com.au

Skip navigation links

In this theme

- About World Heritage
- Criteria
- Implications of listing
- Laws
- Listing
- Location map

World Heritage Areas

- Australian Fossil Mammal Sites
- Blue Mountains
- Central Eastern Rainforest Reserves
- Fraser Island
- Great Barrier Reef
- Heard and McDonald Islands
- Kakadu
- Lord Howe Island
- Macquarie Island
- Purnululu
- Royal Exhibition and Carlton Gardens
- Shark Bay
- Tasmanian Wilderness
- Uluru-Kata Tjuta
- Wet Tropics
- Willandra

Related themes

- Heritage
- DEH Home

Quick links

The Greater Blue Mountains Area
Inscribed 2000

The Greater Blue Mountains Area was inscribed on the World Heritage List at the 24th Session of the World Heritage Committee, held in Cairns from 27 November to 2 December 2000.

It is an area of breathtaking views, rugged tablelands, sheer cliffs, deep, inaccessible valleys and swamps teeming with life. The unique plants and animals that live in this outstanding natural place relate an extraordinary story of Australia's antiquity, its diversity of life and its superlative beauty. This is the story of the evolution of Australia's unique eucalypt vegetation and its associated communities, plants and animals.

The Greater Blue Mountains Area consists of 1.03 million hectares of mostly forested landscape on a sandstone plateau 60 to 180 kilometres inland from central Sydney, New South Wales. The property includes vast expanses of wilderness and is equivalent in area to almost one third of Belgium, or twice the size of Brunei.

The property, which includes eight protected areas in two blocks separated by a transportation and urban development corridor, is made up of seven outstanding national parks as well as the famous Jenolan Caves Karst Conservation Reserve. These are the Blue Mountains, Wollemi, Yengo, Nattai, Kanangra-Boyd, Gardens of Stone and Thirlmere Lakes National Parks.

The area does not contain mountains in the conventional sense but is described as a deeply incised sandstone plateau rising from less than 100 metres above sea level to 1 300 metres at the highest point. There are basalt outcrops on the higher ridges. This plateau is thought to have enabled the survival of a rich diversity of plant and animal life by providing a refuge from climatic changes during recent geological history. It is particularly noted for its wide and balanced representation of eucalypt habitats from wet and dry sclerophyll, mallee heathlands, as well as localised swamps, wetlands, and grassland. Ninety-one species of eucalypts (thirteen percent of the global total) occur in the Greater Blue Mountains Area. Twelve of these are believed to occur only in the Sydney sandstone region.

The property has been described as a natural laboratory for studying the evolution of the eucalypts. The largest area of high diversity of eucalypts on the continent is located in south-east Australia. The Greater Blue Mountains Area includes much of this eucalypt diversity.

As well as supporting such a significant proportion of the world's eucalypt species, the property provides examples of the range of structural adaptations of the eucalypts to Australian environments.

These vary from tall forests at the margins of rainforest in the deep valleys, through open forests and woodlands, to shrublands of stunted mallees on the exposed tablelands.

In addition to its outstanding eucalypts, the Greater Blue Mountains Area also contains ancient, relict species of global significance. The most famous of these is the recently-discovered Wollemi pine, a "living fossil" dating back to the age of the dinosaurs. Thought to have been extinct for millions of years, the few surviving trees of this ancient species are known only from three small populations located in remote, inaccessible gorges within the nominated property. The Wollemi pine is one of the World's rarest species.

More than 400 different kinds of animals live within the rugged gorges and tablelands of the Greater Blue Mountains Area. These include threatened or rare species of conservation significance, such as the spotted-tailed quoll, the koala, the yellow-bellied glider and the long-nosed potoroo as well as rare reptiles including the green & golden bell frog and the Blue Mountains water skink.

Outstanding Universal Values of the Greater Blue Mountains Area

The Greater Blue Mountains Area was inscribed on the World Heritage List against the natural criteria listed below:

Natural criterion (ii) outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.

The combination of fine-scale spatial variation, high environmental complexity and exceptional stability over evolutionary time has allowed some environments and the biota that persist in them to remain largely unchanged over geological time. Even recently, a species of extraordinary global significance, a relict dinosaur of the plant world, the Wollemi pine (Wollemia nobilis) has been discovered in the property.

The steep terrain and sharp environmental gradients have wrought major evolutionary change on some taxa, including the eucalypts, resulting in an exceptional biodiversity within the eucalypt communities that dominate the place. Importantly, the evolutionary processes underpinning this diversity are believed to be ongoing, resulting in an evolutionary 'laboratory' that is exceptional in the World both in its treasures from the past, and its species that are evolving into the future.

Natural criterion (iv) contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The Greater Blue Mountains Area affords representation of a major component of global biodiversity not previously represented on the World Heritage List. A substantial proportion of Australia's biodiversity associated with the range of ecosystems that dominate large parts of the continent and lie between rainforest and arid ecosystems occur within the Greater Blue Mountains Area.

The Greater Blue Mountains Area represents the highest biodiversity in

temperate forest environments with integrity, in Australia and globally, both within and across taxonomic levels. The property includes almost ten percent of the Australian vascular plant flora and is outstanding on a global scale for its biodiversity. Australia, with approximately ten percent of the global total of known vascular plants is a major centre of biodiversity. The Greater Blue Mountains Area also contains a significant number of rare and threatened species, many endemic to the area.

Download information and map of Greater Blue Mountains Area

This information is available as PDF files. You will need Adobe Acrobat Reader installed on your computer to view this file.

- Greater Blue Mountains Area World Heritage Nomination (gbm-nomination.pdf - 5610 KB)
- Supporting Documentation (gbm-supplementary.doc - 675 KB)
- Map of the Greater Blue Mountains Area (gbm-map.pdf - 630 KB)

If you are unable to access this material, please contact the Department of the Environment and Heritage to organise a suitable alternative format.

Further information

World Heritage Values for the Greater Blue Mountains Area

New South Wales National Parks and Wildlife Service:
http://www.npws.nsw.gov.au

Jenolan Caves Reserve Trust:
http://www.jenolancaves.org.au

World Heritage Committee Blue Mountains information (scroll down to 'Australia' and 'Greater Blue Mountains Area')
http://www.unesco.org/whc/nwhc/pages/doc/mainf3.htm

World Heritage Monitoring Centre Blue Mountains natural site data sheet:
http://www.wcmc.org.uk:80/protected_areas/data/wh/blue_mountain.html

The Colong Foundation for Wilderness:
http://www.colongwilderness.org.au

Last updated: Thursday, 07-Oct-2004 16:42:37 EST

Department of the Environment and Heritage
GPO Box 787 Canberra ACT 2601 Australia
Telephone: +61 (0)2 6274 1111

The Greater Blue Mountains Area World Heritage Values

The Greater Blue Mountains Area was inscribed on the World Heritage List in 2000. The World Heritage criteria against which The Greater Blue Mountains Area was listed remain the formal criteria for this property. These criteria have been included in the Values Table below. The World Heritage criteria are periodically revised and the criteria against which the property was listed in 2000 may not necessarily be identical with future criteria.

Examples of the World Heritage values for which The Greater Blue Mountains Area was listed are included in the Values Table for each criterion. These examples are illustrative of the World Heritage values of the property, and they do not necessarily constitute a comprehensive list of these values. Other sources including the nomination document and references listed below the Values Table are available and could be consulted for a more detailed understanding of The Greater Blue Mountains Area.

Values Table

Natural criteria against which The Greater Blue Mountains Area was inscribed on the World Heritage List in 2000	**Examples of World Heritage values of The Greater Blue Mountains Area for which the property was inscribed on the World Heritage List in 2000**
Criterion (ii) outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.	The Greater Blue Mountains Area provides outstanding examples representing on-going ecological and biological processes significant in the evolution of Australia's highly diverse ecosystems and communities of plants and animals, particularly eucalypt-dominated ecosystems. The World Heritage values include: • primitive species with Gondwanan affinities that are of outstanding significance in terms of the evolution of plant life, including the Wollemi Pine (Wollemia nobilis) and the primitive gymnosperm Microstrobus fitzgeraldii; • a centre of diversification of the eucalypts which provides an outstanding record of the products of evolutionary processes associated with the global climatic changes of the late Tertiary and the Quaternary; • the highly unusual juxtaposition of diverse scleromorphic species with Gondwanan taxa; • an exceptional representation of the major eucalypt groups and aspects of their evolution and radiation, including species in the following groups: - genera: Eucalyptus (including Corymbia) and Angophora; - subgenera: Eucalyptus, Corymbia and Symphyomyrtus; • examples of species divergence occurring in a relatively small

	area, including: - differentiation of eucalypt taxa in isolation in response to persistent habitat islands (e.g. those associated with sandstone plateaux isolated by deep valleys) - mutually exclusive distributions of taxa in the series Strictae (the mallee ashes) and Haemostomae (the scribbly ashes) resulting from long-term isolation of breeding populations (allopatric speciation); • eucalypt taxa demonstrating very high levels of hybridisation; • representative examples of dynamic processes in eucalypt-dominated ecosystems, including the full range of interactions between eucalypts, understorey, environment and fire, extending from forests with rainforest boundaries to mallee communities with heath boundaries, demonstrating the exceptional ecological amplitude of the eucalypts.
Criterion (iv) contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.	The Greater Blue Mountains Area includes significant habitats for in situ conservation of biological diversity, including the eucalypts and eucalypt-dominated communities, taxa with Gondwanan affinities, and taxa of conservation significance. The World Heritage values include: • outstanding levels of plant diversity expressed at different taxonomic levels (152 families, 484 genera, ca 1500 species) and for all three measures of species diversity (local species richness or "alpha" diversity, species turnover across environmental gradients or "beta" diversity, and regional species richness or "gamma" diversity); • plant taxa with very high levels of species diversity, including the families - Fabaceae (149 species), Myrtaceae (150 species), Orchideae (77 species), Poaceae (57 species), Asteraceae (69 species), Proteaceae (77 species), Cyperaceae (43 species), and the genera - Eucalyptus (91 species), Acacia (64 species); · exceptional diversity of habitats that contribute to the property being one of the three most diverse areas on earth for scleromorphic species and the only one of these areas that is dominated by trees and without a Mediterranean climate, including plateau tops, ridges, exposed rocks, cliffs, rocky slopes and sheltered gorges and valleys; • exceptional diversity of habitats providing outstanding representation of the Australian fauna within a single place, including 400 vertebrate taxa - 52 native mammals, 265 birds or 33% of the Australian total, 63 reptiles, more than 30 frogs, and examples of species of global significance such as the platypus (Ornithorhynchus anatinus) and the echidna (Tachyglossus aculeatus aculeatus), and invertebrate taxa - butterflies (120 species) and moths (estimated 4000 species); • very high diversity of scleromorphic taxa represented within 20 plant families including Myrtaceae, Proteaceae, Epacridaceae, Fabaceae (Faboideae and Mimosoideae), Dilleniaceae, Rutaceae, and Euphorbiaceae (Tribe Stenolobeae); • ancient, relict species with Gondwanan affinities that have survived past changes of climate within refugia, for example in recessed canyons and perpetually moist areas, including: - the Wollemi Pine (Wollemia nobilis); and - the primitive gymnosperm Microstrobus fitzgeraldii;

	• other primitive species with Gondwanan affinities, including: - Lomatia, Dracophyllum, and Podocarpus; - taxa in the family Lauraceae; - Atkinsonia, the most primitive extant root parasitic genus; and - taxa in the family Winteraceae, such as Tasmannia. • taxa contributing to an exceptional diversity of eucalypts and eucalypt-dominated ecosystems, including: - 2 eucalypt genera (Eucalyptus including Corymbia, Angophora); - 3 eucalypt subgeneric groups (Eucalyptus, Corymbia, Symphyomyrtus); - 91 eucalypt species (13% of the global total); and - highly diverse understoreys of flora and fauna species; • structural forms contributing to an exceptional diversity of eucalypts and eucalypt-dominated ecosystems, including: - tall open forest (towering, single-stemmed trees); - open forest; - woodland; - low open woodland; and - mallee shrubland (small, multi-stemmed shrubs); • more than 70 plant communities, including 56 open forest and woodland communities contributing to an exceptional diversity of eucalypt-dominated ecosystems associated with: - wet environments (including the margins of rainforests); - dry environments (rapidly-draining, drought-prone sandstone plateaux); - low-nutrient environments (including sandstone-derived substrates); - fire-prone environments (including the sandstone plateaux); and - fertile environments (remnants of formerly widespread Tertiary basalts). • high levels of diversity of invertebrate fauna, including Lepidoptera (4000 moth species, 120 butterfly species), and cave invertebrates (67 taxa recorded at Jenolan Caves); • plant taxa of conservation significance and their habitats, including: - endemic species (114 plant species); - relict species; - species with a restricted range; and - rare or threatened species (127 species). • animal taxa of conservation significance and their habitats, including: - endemic species; - relict species; - species with a restricted range; and - rare or threatened species (40 vertebrate taxa - including 12 mammal species and 15 bird species - and 12 invertebrate taxa).

Further information

Description of the Greater Blue Mountains Area

Greater Blue Mountains World Heritage Nomination

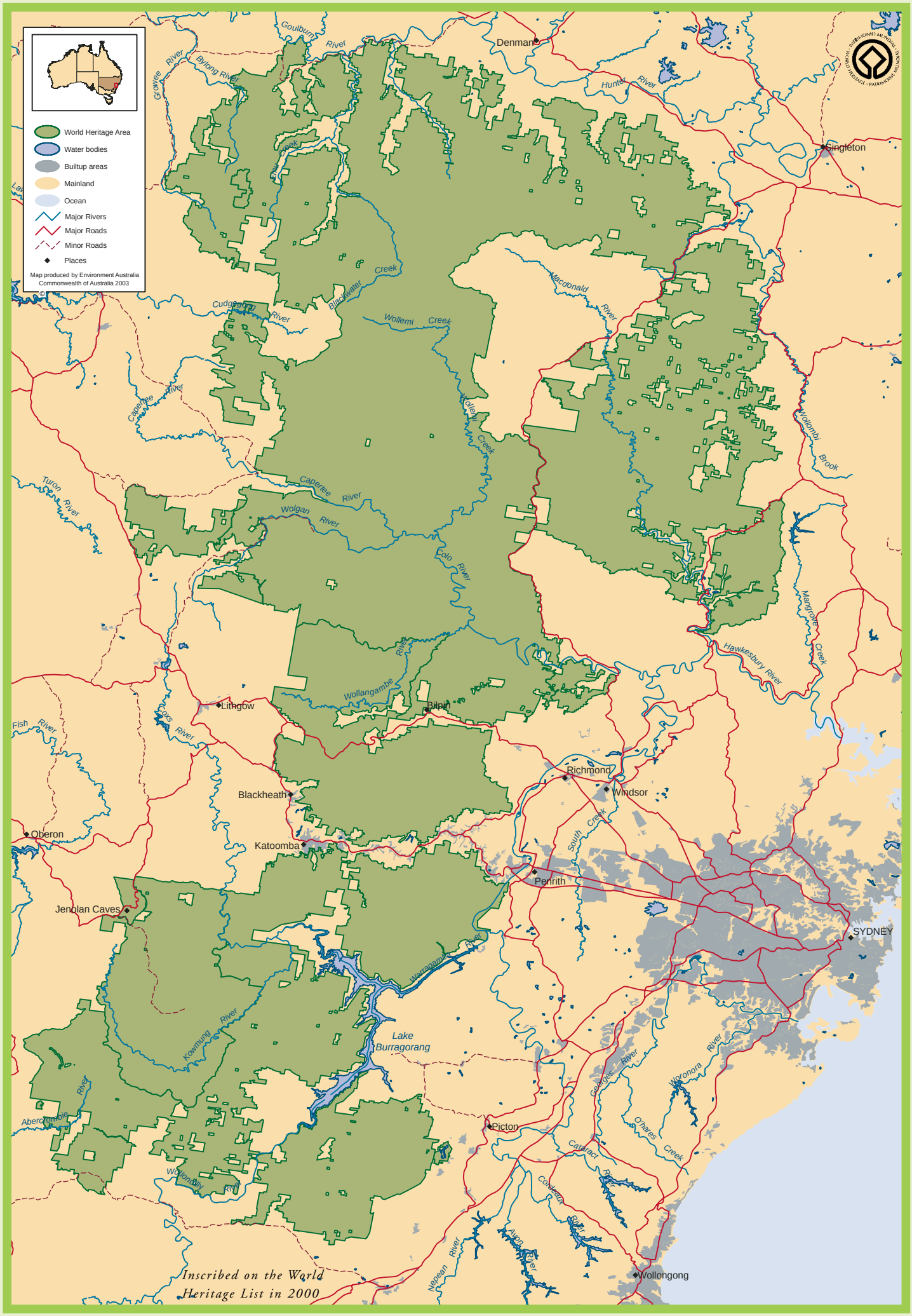
The following documents may be available in the Department of the Environment and Heritage

library:

- *Nomination of The Greater Blue Mountains Area for inscription on the World Heritage List by the Government of Australia.* Prepared by the New South Wales National Parks and Wildlife Service in association with Environment Australia, 1998
- *The Greater Blue Mountains Area World Heritage Nomination*, Supplementary Documentation. Provided by Australia in support of the nomination, January 2000.
- *New Information provided by Australia Regarding the Nomination of The Greater Blue Mountains Area for Inscription on the World Heritage List*, September 2000.

Last updated: Sunday, 20-Jun-2004 05:39:32 EST

Department of the Environment and Heritage
GPO Box 787 Canberra ACT 2601 Australia
Telephone: +61 (0)2 6274 1111



The Greater Blue Mountains Area