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Flora and Fauna Assessment: Appin to West Cliff Pipeline

Final Report

February 2007

Terri-Ann English
Sian Wilkins

Natural & Cultural Heritage Consultants 15-17 Henrietta St Chippendale NSW 2008

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Report for BHP Billiton Illawarra Coal

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ABBREVIATIONS

DEC	NSW Department of Environment and Conservation
DEH	Commonwealth Department of the Environment and Heritage
DNR	Department of Natural Resources
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act* 1979
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
KTP	Key Threatening Process
LGA	Local Government Area
MNES	Matter of National Environmental Significance
NPWS	NSW National Parks and Wildlife Service (now DEC)
ROTAP	Rare or Threatened Australian Plant as listed by Briggs and Leigh
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TSC Act	NSW *Threatened Species Conservation Act* 1995
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

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1.0 SUMMARY

Biosis Research Pty. Ltd. was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to undertake a terrestrial flora and fauna assessment for the Appin to West Cliff Pipeline.

The aims of this study and report were to identify terrestrial flora and fauna issues associated with the proposed pipeline. The specific objectives were:

- to conduct a literature review and database search for the study area;
- undertake field surveys for terrestrial plant and animal species and their habitats;
- describe the plant communities and terrestrial habitat values associated with the study area;
- evaluate and assess the potential impact of the proposed development on threatened species, populations and Endangered Ecological Communities within the study area in accordance with the Director General requirements; and,
- provide recommendations to avoid potential impacts of the proposed development on the natural values of the study area and, where avoidance is not possible, recommendations to minimise impacts.

The study area was assessed using a combination of habitat-based assessment and targeted surveys. The study area consists of the area of earthworks for the proposed pipeline, the proposed corridor for vehicle access and a buffer of approximately 15 m on either side of pipeline which includes an area of indirect impacts.

The study area supports native vegetation in moderate to good condition, with disturbances such as Appin Road, Appin Colliery, tracks and the existing powerline easement impacting the bushland. The study area is surrounded by dense native vegetation to the north, east, south, and west, with Dharawal State Conservation Area and Sydney Catchment Authority land occurring in the vicinity of the study area.

Three native vegetation communities were recorded in the study area: Exposed Sandstone Scribbly Gum Woodland, Western Sandstone Gully Forest and Shale Sandstone Transition Forest. The native vegetation was considered to be in moderate to good condition. Part of the area within Appin Colliery land supporting scattered trees over a mown exotic understorey and was not considered to support a native vegetation community.

The proposed pipeline will generally be contained in existing disturbed areas, such as within an existing pipeline trench within Appin Colliery land, along an existing track parallel to Appin Road and along an existing track and powerline

easement on the ridgetop. Where possible, direct disturbances to native vegetation will be avoided, however, some areas of native vegetation will required to be directly impacted, including a patch of SSTF within and adjoining Appin Colliery land and a small gully through ESSW between the existing track and existing powerline easement.

Based on the vegetation mapping of the area, the proposed works will involve clearing approximately 0.5 ha of native vegetation, with a further 1.3 ha indirectly impacted. This is likely to be an overestimate given that an area within the Appin Colliery land is incorrectly mapped as supporting SSTF, when it was found to support scattered trees over a mown understorey, not a native vegetation community. Impacts to a maximum of 2 ha of native vegetation was not considered to be a significant impact given that it represents relatively small proportion (0.01%) of similar habitat types in the local area.

One Endangered Ecological Community as listed on the TSC and EPBC Acts was recorded in the study area: Shale Sandstone Transition Forest. No threatened plant species listed under the TSC or EPBC Acts were recorded in the study area, however, potential habitat for five threatened plant species was recorded: *Acacia bynoeana, Epacris purpurescens* var. *purpurescens, Grevillea parviflora* ssp. *parviflora, Persoonia hirsuta* and *Pultenaea aristata*. Significant Impact Criteria were considered for those threatened species and ecological communities that are listed under the EPBC Act. It was found that the proposal was not likely to have a significant impact and, as such, a Referral under the EPBC Act is not recommended.

Fauna habitat within the study area largely consisted of Woodland habitat with two waterbodies Georges River and unnamed ephemeral tributary. Although part of these habitats has been previously disturbed within the study area, they are considered to be in good condition.

A total of 40 threatened or migratory animal species or their habitat have been previously recorded within the local area. No threatened animal species were recorded within the study area, however potential habitat for 19 threatened species(Green and Golden Bell Frog *Litoria aurea,* Red-crowned Toadlet *Pseudophryne australis,* Gang- gang Cockatoo *Callocephalon fimbriatum,* Glossy Black-cockatoo *Calyptorhynchus lathami,* Black-faced Monarch *Monarcha melanopsis,* Rufous Fantail *Rhipidura rufifrons,,* Regent Honeyeater *Xanthomyza Phrygia,* Swift Parrot *Lathamus discolour,* Turquoise Parrot *Neophema pulchella,* Barking Owl *Ninox connivens,* Powerful Owl *Ninox strenua,* Eastern Pygmy-possum *Cercartetus nanus,* Eastern Freetail Bat *Mormopterus norfolkensis,* Southern Brown Bandicoot *Isoodon obesulus,* Grey-headed Flying-fox *Pteropus poliocephalus,* Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis,* Large-eared Pied Bat *Chalinolobus dwyeri,* Eastern

False Pipistrelle *Falsistrellus tasmaniensis,* Large-footed Myotis *Myotis adversus,* Broad-headed Snake *Hoplocephalus bungaroides, Rosenberg's Goanna Varanus rosenbergi)* occurs within the study area.

The proposed pipeline works are likely to remove or modify potential breeding and foraging resources within the study area. Given the extent of the potential habitat in the local area (approximately 13,365 ha) for these species and the fact that the disturbed areas are to be regenerated post works it is unlikely that the proposal would result in the loss or disturbance of limiting foraging resources; and/or loss or disturbance of limiting breeding resources for these species. Furthermore with suitable mitigation measures such as site rehabilitation and sedimentation control devices, impacts on fauna habitats will be minimised.

The results from the Anabat detector identified five bat species (Table 2) including the Southern Myotis, which is listed as Vulnerable on the TSC Act. In addition to this, one other threatened species was possibly recorded, however due to the quality of the recording and interference it was difficult to determine the bat species. The most likely species are Eastern Broad –nosed Bat *Scotorepens orion*, Greater Broad-nosed Bat *Scoteanax rueppellii* or Eastern False Pipistrelle. Two of these species (Greater Broad-nosed Bat and Eastern False Pipistrelle) are listed as threatened on the TSC Act, and like the Southern Myotis would occur in the woodland habitat within the study area. These features are widely represented in the study area and local area; hence it is unlikely the proposed works would have a significant impact on the Woodland habitat. No assessments of significance have been prepared for these species as they are listed on the TSC Act therefore not considered under a Part 3A application.

The proposed works are unlikely to have a significant impact on threatened species, endangered ecological communities or populations, however, a range of mitigation measures have been recommended to ameliorate impacts on terrestrial flora and fauna, including:

- where possible trees should be retained, particularly those with hollows;
- appropriate sediment/erosion and drainage control devices should be utilised during and after excavation works;
- To minimise the likelihood of weed spread or the introduction of disease, vehicles should be cleaned prior to use in the study area;
- *Acacia bynoena* and *Persoonia hirsuta* specimens within and adjacent to the study area should be identified and flagged prior to works commencing and, where possible, damage to these specimens should be avoided.

- any landscaping, revegetation or rehabilitation works should use locally endemic tubestock; and,
- bush regeneration techniques such as brush matting, spread of cleared native biomass over disturbed areas and weed control should be used to encourage native regeneration. These techniques should be implemented by suitably qualified and experienced people.

In addition it should be noted that although this proposal is being assessed under Part 3A of the EP&A Act, hence Assessments of Significance under the TSC Act are not required, impacts on potential habitat for threatened species listed on the TSC Act was, however, considered and also deemed insignificant given the small area of impact and the extensive quantity of similar habitat types in the local area.

2.0 INTRODUCTION

2.1 Background

Biosis Research Pty. Ltd. was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to undertake a terrestrial flora and fauna assessment for the Appin to West Cliff Pipeline. This report assesses the conservation significance of the study area in terms of threatened species, populations (and/or their habitats) and ecological communities that occur, or have the potential to occur in the study area in accordance with the requirements of the NSW *Environmental Planning and Assessment Act* 1979 (EP&A Act), NSW *Threatened Species Conservation Act* 1995 (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

A preliminary assessment was undertaken for the proposed development, which identified a number of threatened plant and animal species with potential habitat in the area. During the preliminary assessment, not all areas of the study area were surveyed due to access restrictions. The purpose of this assessment is to undertake targeted searches for those threatened species and to assess the impact of the proposed development on flora and fauna values of the area.

This assessment has been undertaken under Part 3A of the EP&A Act and in accordance with the Director General's Requirements dated 15th November 2006, and Sections 3 and 5 of the DEC Threatened Biodiversity Survey and Assessment Guidelines (DEC 2004).

2.2 Study Area

The study area comprises a 900 m section of pipeline easement between the Appin Colliery surface Coal Lease boundary to the West Cliff Mine surface Coal Lease boundary, southeast of Appin, NSW (refer to Figure 1).

Commencing at Appin Colliery in the west, the pipeline follows an access road and established track before descending towards the Georges River in the vicinity of Kings Falls Bridge. The pipeline travels under the bridge and continues in a south-easterly direction along a dirt road alongside the Appin/Bulli Road. At the top of a road cutting, the pipeline easement turns to the east and crosses a 200 m section of bushland before meeting with the 33 KV overhead transmission easement. The pipeline easement follows the electricity easement until it meets the boundary of the West Cliff mine. Excepting the area of bushland, the proposed pipeline route is predominantly within existing services easements.

The study area is located within the Wollondilly Local Government Area (LGA).

2.3 Proposed works

The current survey area for the proposed pipeline will be constructed as a buried 110 mm poly pipeline. The pipeline will be laid into a trench 360 mm wide x 600 mm deep. The trench will be excavated in materials as found, including areas of both solid sandstone and soil strata. In areas of trenching through solid rock, the trench dimensions may be reduced to 250 mm wide x 300 mm deep. In such areas the trench will be backfilled with mass concrete. The trench through soil strata will be backfilled with excavated material.

The trenched sections of pipeline will be within a 10 m wide construction corridor. Machinery is not expected to operate outside the 10 m easement, except where needed for establishment of erosion and sediment control measures.

Following installation of the pipeline and trench backfilling, erosion control measures will be removed, unless required for ongoing protection. Any excess material shall be removed and the disturbed areas track rolled. Brush shall be cut from the surrounding vegetation and spread over the disturbed area to promote regrowth (brush-matting).

2.4 Definitions

The **proposed development** is the Appin to West Cliff pipeline.

The **subject site** is the area directly impacted by the proposed development and includes a 5 m buffer either side of the pipeline to account for construction vehicle movements and access.

The **study area** includes the subject site and any area indirectly impacted by the proposed development. For the purposes of this assessment, a buffer of 10 metres for indirect impacts has been assumed. The study area is illustrated in Figure 2 and described in Section 2.4.

The **local area** is defined as a 10 km radius from the subject site.

Direct impacts include but are not limited to acute death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat (DEC 2005l). In relation to the proposed development, direct impacts include the clearing and crushing of native vegetation within the subject site and fragmentation of habitat.

Indirect impacts include but are not limited to starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious changes in the water table, increased soil salinity, promotion of erosion, inhibition of nitrogen fixation, provision of suitable seed

bed for exotic weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas (DEC 2005l). In relation to the proposed development, indirect impacts include the potential for the introduction and spread of weed species, erosion, increase in human activity, rubbish dumping and edge effects. The indirect impacts have been calculated based on a 10 m buffer around the subject site.

Threatened biota means threatened species, populations or ecological communities (or their potential habitats) as listed under the TSC Act or EPBC Act.

A **key threatening process** (KTP) is defined in the TSC Act as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities (DEC 2006b). Something can be a threatening process if it;

- adversely affects two or more threatened species, populations or ecological communities; or
- could cause species, populations or ecological communities that are not currently threatened to become threatened.

A list of KTPs is maintained in the relevant sections of the TSC Act and EPBC Act and includes such processes as vegetation clearing, predation and competition by a variety of introduced plants and animals.

2.5 Aims

The general aim of this report is to undertake a terrestrial flora and fauna assessment of the study area and to determine the impact of the proposal on any matter of conservation significance.

The specific aims are to:

1. to conduct a literature review and database search for the study area;
2. undertake field surveys for terrestrial plant and animal species and their habitats;
3. describe the plant communities and terrestrial habitat values associated with the study area;
4. evaluate and assess the potential impact of the proposed development on threatened species, populations and Endangered Ecological Communities within the study area in accordance with the Director General requirements; and,

5. provide recommendations to avoid potential impacts of the proposed development on the natural values of the study area and, where avoidance is not possible, recommendations to minimise impacts.

3.0 METHODS

The study area was inspected on 16 and 17 January 2007. The general condition of the study area was assessed and observations made of plant and animal species and plant communities as detailed below. During the site visit the weather was hot and sunny.

Data from the previous survey of the study area, undertaken on 9 August 2006, was also utilised in this report.

3.1 Taxonomy

The plant taxonomy (method of classification) used in this report follows Harden (1990, 1992, 1993, 2002) and subsequent advice from the National Herbarium of NSW. In the body of this report plants are referred to by their scientific names only. Common names, where available, have been included in the Appendices.

Names of vertebrates follow the Census of Australian Vertebrates maintained by Department of Environment and Heritage (DEH). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices.

3.2 Literature and Database Review

A list of documents used to prepare this report is located in *References*. Records of threatened biota were obtained from the Department of Environment and Conservation (DEC) *Atlas of NSW Wildlife* (Department of Environment and Conservation 2007) within a 10 km radius of the study area, using the Wollongong 1:100 000 map sheet. Records for threatened biota listed on the EPBC Act were obtained from the DEH *EPBC Act Online Database – Protected Matters Search Tool* (Department of the Environment and Heritage 2004) within a 10 km radius of the study area. Database searches were conducted in January 2007.

A number of detailed flora and fauna surveys within the local area have been previously undertaken by Biosis Research. Information from these surveys has been used in assessing the impacts of the proposed development on the ecological values within the study area. These surveys include but are not limited too;

- Richardson, M.B.G. & English, T. 2002, *Terrestrial Flora and Fauna Habitat Assessment AppinColliery LW 406 &408*, Biosis Research Pty. Ltd.,

- Richardson, M.B.G. & English, T. 2002, *Terrestrial Flora and Fauna Habitat Assessment West Cliff Colliery LW 5A5-5A8.*, Biosis Research Pty. Ltd.,
- Richardson, M.B.G., Predavec, M. & O'Sullivan, T. 2001, *Dendrobium Coal Project Species Impact Statement*, Biosis Research Pty. Ltd. for BHP Billiton, Sydney.

3.3 Flora Survey

Plants growing in the study area were surveyed by undertaking a habitat assessment as well as targeted searches for threatened species. The vegetation communities were surveyed using the random meander technique described by Cropper (1993).

3.3.1 Flora Habitat Assessment

Flora habitat was assessed according to the degree it resembles relatively natural, undisturbed vegetation. Vegetation was assessed as being Good, Moderate, Poor or unnatural according to the following criteria:

- species composition (species richness, degree of weed invasion);
- vegetation structure (representation of each of the original layers of vegetation);
- resilience (this is the capacity for natural regeneration which is inherently linked to the degree to which the natural soil profile has been disturbed).

The categories of vegetation conditions are as follows:

Good: containing a high number of indigenous species; no weeds present or weed invasion restricted to edges and track margins; vegetation community contains original layers of vegetation; vegetation layers (ground, shrub, canopy etc.) are intact, or if modified, natural soil profile remains intact.

Moderate: containing a moderate number of indigenous species; moderate level of weed invasion; weeds occurring in isolated patches or scattered throughout; one or more of original layers of vegetation are modified; vegetation layers (ground, shrub, canopy etc.) are largely intact, or if modified, natural soil profile remains intact; able to be regenerated to Good condition with minimal level of management.

Poor: containing a low number of indigenous species; high level of weed invasion; weeds occurring in dense patches or scattered throughout; one or more of the original layers of vegetation are highly modified; one or more original vegetation layers (ground, shrub, canopy etc.) are modified or missing, but natural soil profile intact; able to be regenerated to Moderate or Good condition with substantial management.

Unnatural landscape: highly modified landscape containing few or no indigenous species; exotic species dominant; original native vegetation layers removed; natural soil profile disturbed; unable to be regenerated to natural condition.

3.4 Fauna Survey

This assessment is largely based on the presence or absence of suitable habitat for a threatened species. Detailed survey techniques were not considered necessary as the habitat based approach is conservative in nature, requiring only the presence of habitat, not individual records, for a threatened species to be considered further. Given the size, disturbance of the study area and extent of previous surveys in the area the methodology employed for this assessment is sufficient to determine if the proposed development would have a significant impact on any threatened terrestrial fauna.

In addition to the habitat assessment, bird and reptile surveys were undertaken and an Anabat detector was also was used to record Microchiropteran bat calls (echolocation).

3.4.1 Fauna Habitat Assessment

The three categories used to evaluate habitat value were Good, Moderate or Poor, as detailed below:

Good: ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native animal species.

Moderate: ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native animal species.

Poor: ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native animal species.

Other habitat features, such the value of the study area as a habitat corridor, the presence of remnant communities or unusual ecological vegetation community structures, were also used to assess habitat quality.

3.4.2 Fauna Surveys

Bird surveys were undertaken using a meander method and recording all birds heard and observed during the site visit. Rocks, logs and other possible shelters were actively searched for reptiles. Pools and drainage lines were surveyed for tadpoles and evidence of any introduced fish eg *Gambusia holbrooki*.

An Anabat detector (Titley Electronics) with time delay switch was used to record Microchiropteran bat calls (echolocation). Calls can provide information on frequency and call sequence, allowing species identification. The detector was set before dusk within or near a suspected bat fly-way, leaving it to record for a period of time. Fly-ways may include overgrown tracks and roads, beneath the canopy of streams and creeks, over larger water bodies (ponds, lakes) or within gaps or along edges of forest/woodland vegetation.

3.5 Impact Assessment

Impact assessments were carried out on threatened biota that occur or have the potential to occur within the study area based on the presence of suitable habitat.

For threatened biota listed on the EPBC Act which maybe impacted by the proposed development , EPBC Act Significant Impact Criteria are required to be considered. In the instance that the Significant Impact Criteria identifies that a significant impact on a species is likely, then a Referral to the Federal Minister for the Environment may be required.

Although this project is seeking approval under Part 3A of the EP&A Act, hence does not need to assess threatened species, populations and Endangered Ecological Communities listed on the TSC Act, they have been considered in this report in determining the impacts of the proposed development on the ecological values of the study area.

3.6 Limitations

Some plant species that occur in the local area are annuals (completing their life cycle within a single season) and are present only in the seed bank for much of the year. Other plant species are perennial but are inconspicuous unless flowering. Similarly, some fauna may be seasonally absent from the study area.

This study was by design a habitat assessment conducted in accordance with the methodology employed for an assessment under Section 5A of the EP&A Act. Therefore no trapping, spotlighting, call playback or vegetation quadrat sampling techniques were used. As the assessment is based on presence or absence of suitable habitat for a threatened species, such techniques are not necessary as the

habitat based approach is conservative in nature, requiring only the presence of habitat, not individual records, for a threatened species to be considered further. The methodology employed for this assessment is sufficient to determine if the proposed development would have a significant impact on any threatened biota as listed on the TSC Acts or EPBC Acts.

4.0 RESULTS

A list of the plant and animal species recorded during the survey are provided in Appendix 1 and Appendix 2 respectively.

4.1 Soil

The soil landscape is mapped at a 1:100,000 scale as Lucas Heights (map unit lh) over the majority of the study area, with Hawkesbury (map unit ha) in the vicinity of the Georges River (Hazelton *et al.* 1990).

Lucas Heights soil landscape is described as gently undulating crests, ridges and plateau surfaces of the Mittagong formation (Hazelton *et al.* 1990). Hawkesbury soil landscape is described as rugged, rolling to very steep hills on Hawkesbury Sandstone (Hazelton *et al.* 1990).

4.2 Plant Communities

4.2.1 Vegetation mapping

Part of the study area falls in a gap between the mapped extent of the Cumberland Plain vegetation mapping (NPWS 2002b) and the vegetation mapping of the Woronora, O'Hares and Metropolitan catchments (NPWS 2003a). This area was, however, mapped by Biosis Research during recent detailed surveys for the West Cliff site (Biosis Research 2007). The vegetation mapping of the study area (Figure 3) therefore uses combined data from the Biosis Research surveys and the Cumberland Plain vegetation mapping (NPWS 2002b).

The study area has been mapped as supporting four vegetation communities (Figure 3): Shale Sandstone Transition Forest (High Sandstone Influence), Sandstone Ridgetop Woodland, Western Sandstone Gully Forest and Exposed Sandstone Scribbly Gum Woodland. It should be noted that Sandstone Ridgetop Woodland is now included as part of the Sandstone Scribbly Gum Woodland community, hence is not discussed as a separate community in this report.

The vegetation communities recorded in the study area during the current survey are described below.

4.2.2 Current Survey

The native vegetation communities that will be impacted by the proposed pipeline are Exposed Sandstone Scribbly Gum Woodland along the ridgetop, Western Sandstone Gully Forest along the Georges River and Shale Sandstone Transition Forest within and immediately adjoining the Appin Colliery land (in accordance with the vegetation community descriptions of DEC (NPWS 2003a)).

Within the study area, Exposed Sandstone Scribbly Gum occurs along the ridgetop across an ephemeral drainage line and underneath the slashed powerline easement. This vegetation community was dominated by *Eucalyptus racemosa* and *Corymbia gummifera* in the canopy, with the midstorey dominated by *Banksia serrata* and the shrub layer supporting a dense cover of *Banksia spinulosa, Lambertia formosa, Leptospermum trinervium* and *Persoonia levis*. The understorey was dominated by ferns such as *Pteridium esculentum*; grasses and sedges such as *Anisopogon avenaceus* and *Cyathochaeta diandra*; and small shrubs and herbs such as *Grevillea mucronulata, Eriostemon australasius, Gonocarpus teucrioides, Grevillea diffusa ssp. diffusa, Lomandra longifolia* and *Pomax umbelata.* This vegetation was considered to be in Good condition, with no weed species present and all structural layers intact. The only exception to this is the area underneath the powerline easement, which has been slashed to a height of approximately 1 m. In this area the vegetation was considered to be in Moderate condition given the structural disturbance of the vegetation.

The road batters along Appin Road were highly disturbed and considered to be an unnatural landscape given the soil disturbance and lack native species diversity and natural resilience. This area was dominated by exotic grasses such as *Eragrostis curvula* and *Cynodon dactylon.* A few occasional native shrubs of *Acacia longifolia* were also recorded growing on the batters, likely to have spread from the adjoining bushland areas. Weed species such as *Paspalum urvillei*, *Rubus fruticosus* and *Opuntia* spp. were recorded along the edges of the bushland where it bordered Appin Road, likely to be impacts from runoff.

The vegetation along the banks of the Georges River was a transitional area between Western Sandstone Gully Forest and Exposed Sandstone Scribbly Gum Woodland, with characteristic species of both communities occurring. The canopy dominants in this area were *Eucalyptus racemosa, E. eugenioides* and *E. resinifera,* with *E. piperita* also occurring. The small tree layer supported *Angophora bakeri* and *Allocasuarina littoralis,* with *Kunzea ambigua, Dodonaea triquetra, Persoonia linearis* and *Acacia longifolia* occurring in the shrub layer. The understorey supported *Lomandra longifolia*, *Echinopogon ovatus* and *Dianella caerulea* var. *producta.* The vegetation in this area was considered to be in Moderate condition, with disturbances such as rubbish dumping and some weed species (*Rubus fruticosus, Setaria gracilis, Ligustrum sinense, Eragrostis*

curvula and *Pennisetum clandestinum*) scattered along track and roadside edges. The area underneath Kings Fall Bridge was mostly cleared of native vegetation, with only weed species such as *Ageratina adenophora* and *Ligustrum sinense* occurring. The Georges River was not flowing at the time of survey; however *Typha* sp. and *Juncus* sp. were recorded within the banks of the river growing in water logged areas and areas supporting small pools.

The proposed pipeline route within the Appin Colliery was relatively disturbed, with the majority of the area supporting scattered trees of *Angophora floribunda, Corymbia gummifera, Eucalyptus resinifera, E. punctata* and *E. sieberi* over a mown grassy understorey of *Cynodon dactylon* and *Pennisetum clandestinum.* The proposed pipeline route would follow an existing pipeline within this area, minimising disturbance to the existing trees. This area is likely to have supported Shale Sandstone Transition Forest (SSTF), however, due to the high level of disturbance to the vegetation in this area, such as highly simplified structure and species diversity, it is no longer considered to support SSTF.

The eastern section of the proposed pipeline within the Appin Colliery land traverses a small patch of regrowth SSTF, supporting trees of *Corymbia gummifera, Eucalyptus resinifera* and *E. racemosa.* The midstorey was dominated by species such as *Allocasuarina littoralis,* juvenile Eucalypts and the exotic tree *Acer negundo*. The shrub layer supported *Bursaria spinosa* and *Acacia decurrens.* The understorey was fairly disturbed and was dominated by grasses such as *Imperata cylindrica* and *Microlaena stipoides.* Exotic vines such as *Araujia hortorum* and *Lonicera japonica* were also recorded in this patch. This area was considered to be in moderate condition given the disturbance and the relatively low species diversity.

4.3 Endangered Ecological Communities

Shale Sandstone Transition Forest (SSTF) is listed as an Endangered Ecological Community (EEC) on the TSC and EPBC Acts. SSTF was recorded along the western section of the proposed route and was considered to be in moderate condition. The impacts of the proposed development on this EEC are discussed in Section 5.0.

4.4 Flora

A total of 137 vascular plant species were recorded from the study area, comprising 118 (86%) locally indigenous species and 19 (14%) exotic species. A list of plant species recorded is provided in Appendix 1.

Nine species considered vulnerable in the western Sydney region (regionally significant) were recorded in the study area (James *et al.* 1999) *Alphitonia*

excelsa, Conospermum taxifolium, Dodonaea camfieldii, Grevillea diffusa ssp. *diffusa, Lepidosperma filiforme, Lepidosperma urophorum, Mirbelia speciosa* ssp. *speciosa, Oxalis perennans* and *Petrophile sessilis.*

Three of the exotic species recorded in the study area are classed as noxious weeds in the Wollondilly LGA: *Asparagus asparagoides* (Class 5), *Opuntia* sp. (Class 4) and *Rubus fruticosus* (Class 4). The legal requirements of these classes of noxious weeds are as follows:

Class 4: The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed

Class 5: The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with

4.4.1 Significant Flora

Sixteen threatened plant species listed on the TSC Act (Figure 4) and/or the EPBC Act and/or their habitat have been previously recorded within the local area (Department of Environment and Conservation 2007, Department of the Environment and Heritage 2007).These threatened plant species are considered in this report (Table 1).

No threatened plant species were recorded within the study area, however, potential habitat exists in the study area for five threatened plant species: *Acacia bynoeana, Grevillea parviflora* spp. *parviflora, Persoonia hirsuta* and *Pultenaea aristata* (Table 1). These species are discussed further in the Impact Assessment (Section 5.0).

Table 1: Terrestrial flora listed on the TSC Act or EPBC Act that have the potential to occur in the local area

Species	Status			Habitat	Potential Habitat
	EPBC Act[1]	TSC Act[2]	ROTAP [3]		
Acacia baueri ssp. *aspera*	-	V	2R	Restricted to the Sydney region, occurring on the Kings Tableland in the central Blue Mountains and with sporadic occurrences on the Woronora Plateau in the Royal National Park, Mt. Keira district and at Wedderburn. Occurs in low, damp heathlands, often on exposed rocky outcrops. Appears to prefer open conditions; rarely observed where there is any shrub or tree canopy development; and many of the observations of this species have been made following fire, suggesting the species prefers early successional habitats. Peak flowering occurs December to March. (DEC 2005e)	No. No low damp heathlands in study area.

Species	Status			Habitat	Potential Habitat
	EPBC Act[1]	TSC Act[2]	ROTAP [3]		
Acacia bynoeana	V	E1	3V	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches (DEC 2005a).	Yes, along powerline easement and track margins.
Caladenia tessellata	V	E1	3V	Low open forest with heath or sometimes grass understorey this species only grows in very dense shrubbery in coastal areas (Bishop 1996). Currently known from two disjunct areas: Braidwood on southern tablelands and three populations in Wyong area on the Central Coast (DEC 2005b).	No. Study area not coastal.
Cryptostylis hunteriana	V	V	3V	This species typically grows in swamp-heath on sandy soils chiefly in coastal districts (Harden 1993) but has also been recorded on steep bare hillsides (Bishop 1996).	No. No Swamp-heath in study area.
Cynanchum elegans	E	E1	3Ei	Rainforest gullies scrub and scree slopes in Gloucester and Wollongong districts (Harden 1992). Occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities (NPWS 2002a). Has been recorded in dry subtropical rainforest, littoral rainforest, *Leptospermum laevigatum-Banksia integrifolia* Coastal scrub, *Eucalyptus tereticornis* forest and woodland, *Corymbia maculata* forest and woodland and *Melaleuca armillaris* scrub to open scrub (NPWS 2002a).	No. No rainforest gullies in study area.
Epacris purpurascens var. *purpurascens*	-	V	2K	Sclerophyll forest, scrub and swamps from Gosford and Sydney districts (Harden 1992) specifically this species is thought to require wet heath vegetation (T. James pers. comm.). Characteristically found in a range of habitat types, most of which have a strong shale soil influence. These include ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities (including Shale Sandstone Transition Forest). Also occurs in riparian zones draining into Sydney Sandstone Gully Forest, shale lenses within sandstone habitats and colluvial areas overlying or adjoining sandstone or tertiary alluvium. Has been recorded from Gosford, Narrabeen, Silverdale and Avon Dam vicinity (DEC 2005c)	Possible, In SSTF and Western Sandstone Gully Forest in study area.
Grevillea parviflora ssp. *parviflora*	V	V	-	Sporadically distributed throughout the Sydney Basin with the main occurrence centred around Picton, Appin and Bargo. Separate populations are also known further north from Putty to Wyong and Lake Macquarie on the Central Coast and Cessnock and Kurri Kurri in the Lower Hunter. Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Often	Yes, in SSTF in the study area.

Species	Status			Habitat	Potential Habitat
	EPBC Act[1]	TSC Act[2]	ROTAP [3]		
				occurs in open, slightly disturbed sites such as along tracks. Flowering has been recorded between July to December as well as April-May (DEC 2005d).	
Leucopogon exolasius	V	V	2V	Woodland on sandstone, restricted to the Woronora and Grose Rivers (Harden 1991). The plant occurs in woodland on sandstone and prefers rocky hillsides along creek banks (NPWS 1997). Flowering occurs in August and September.	No. No rocky hillsides in study area.
Melaleuca deanei	V	V	3R	Grows in wet heath on sandstone (Harden 1991). Occurs in two distinct areas of Sydney (Ku-Ring-Gai/Berowra and Holsworthy/Wedderburn) and has isolated occurrences in the Blue Mountains, Nowra and Central Coast areas (DEC 2005f). Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate.	No. No wet heath in study area.
Persoonia bargoensis	V	E1	2V	Restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau. Its entire range falls between Picton, Douglas Park, Yanderra, Cataract River and Thirlmere. Occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravely soils typical of Shale Sandstone Transition Forest. Like most Geebungs this species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides (DEC 2005g).	No. Study area to the east of known distribution.
Persoonia hirsuta	E	E1	3Ki	Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone and shale-sandstone transition areas (DEC 2005h). *P. hirsuta* is found from Gosford to Berowra and Manly to Royal NP.	Yes, in ESSW and SSTF.
Persoonia nutans	E	E1	2Ei	Grows in Woodland to dry sclerophyll forest on clay soils and old alluviums on the Cumberland Plain (Robinson 1994, Harden 2002). It is restricted to Castlereagh Scribbly Gum Woodlands, Agnes Banks Woodland, Shale Gravel Transition Forest and Cooks River Castlereagh Ironbark Forest (NPWS 2003b). Peak flowering is from December to January with sporadic flowering all year round.	No. Study area not on clay or alluvium and listed vegetation communities not present in study area.
Pomaderris brunnea	V	V	2V	Open forest confined to the Colo River & upper Nepean River (Harden 1990), on clay & alluvial soils (Fairley and Moore 1995). In the Hawkesbury/Nepean region, the species is known to be associated with Dry sclerophyll forests (Cumberland, Upper Riverina, Sydney Coastal, Sydney Hinterland, Sydney Sand Flats), Coastal Floodplain Wetlands and Coastal Valley Grassy Woodlands (DEC 2005i).	No. study area not on clay or alluvial soils.
Pterostylis saxicola	E	E1	-	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines (NSW Scientific Committee 1997). The vegetation communities that occur above the shelves are either shale/sandstone transition or shale communities. Often occurs near	No. No rock shelves above cliff lines in study area.

Species	Status			Habitat	Potential Habitat
	EPBC Act[1]	TSC Act[2]	ROTAP [3]		
				streams. Picnic Point to Picton (Harden 1993). Currently known from only 5 localities (NSW Scientific Committee 1997). ROTAP; 2E	
Pultenaea aristata	V	V	2V	Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. The species occurs in either dry sclerophyll woodland or wet heath on sandstone. Flowering has been recorded in winter and spring (DEC 2005j).	Yes, previously recorded along Georges River.
Pultenaea pedunculata	-	E1	-	Restricted to the Cumberland Plain and near Merimbula where it grows in dry sclerophyll forest and disturbed sites (Harden 2002). In western Sydney it occurs in three locations: within industrial and residential areas at Villawood and Prestons, and north-west of Appin between the Nepean River and Devines Tunnel No. 2 (DEC 2005k). It occurs in clay or sandy clay soils (Blacktown soil landscape) on Wianamatta shale, close to localised patches of Tertiary alluvium (Liverpool) or the shale/sandstone influence (west of Appin) (DEC 2005k). At all sites there is a lateritic influence in the soil with characteristic ironstone gravels present (DEC 2005k). This species is known to occur in remnants of Cooks River Clay Plain Scrub Forest (James *et al.* 1999).	No. Study area not on shale soils.

Key: 1) Listed on the EPBC Act as Endangered (E) or Vulnerable (V)
2) Listed on the TSC Act as Endangered (E1), or Vulnerable (V)
3) ROTAP= Rare or Threatened Australian Plant (Briggs and Leigh 1995); for description of codes see Appendix 3

4.5 Fauna Habitats

The study area largely occurs within the existing easements (road, telecommunication and powerline (Plate 4 and 6)) and has been previously disturbed by infrastructure such as telecommunication cables and roads. The fauna habitat within the study area consists largely of woodland habitat and broadly corresponds to the plant communities outlined in Section 4.2. Finer scale habitat features include rock outcrops, overhangs, tree hollows and leaf litter. Animal species may utilise some of these features wholly or partly, in conjunction with one another, or may depend entirely on one specific habitat type. These habitats features and species associations are discussed in further detail below.

Woodland

Woodlands provide a wide range of foraging and sheltering habitat for vertebrate fauna. Gum trees dominate the upper canopy in these areas and supply direct (foliage, nectar, exudates) and indirect food (arthropods) for a range of

vertebrates. In particular, native trees such as *Eucalyptus punctata* and *Allocasuarina littoralis* are considered feed trees for threatened species including Koala *Phascolarctos cinereus,* and Glossy Black-cockatoo *Calyptorhynchus lathami*.

A few small tree hollows (formed in stags, mature and/or senescent trees) were recorded in the study area, providing nesting and roosting habitat for a range of common birds and arboreal mammal species. Locally recorded threatened species requiring tree-hollows for mating and nesting include the Gang-gang Cockatoo *Callocephalon fimbriatum*, Glossy Black-cockatoo and micro-bats.

Understorey and shrub vegetation are relatively open and dominated by native species. The ground cover has a moderate layer of leaf litter and fallen branches and bark (scattered throughout forested areas), providing refuge and nesting habitat for a range of terrestrial animals. Many invertebrates and amphibians rely on these 'moisture-retaining' microhabitats to over-winter or as refuge during periods of drought. Similarly, many reptiles rely on ground litter and debris for shelter and foraging.

Woodland habitat (Plate 5) within the study area was considered to be in Moderate to Good condition, with the ground flora containing a high number of indigenous species; ground, log and litter layer largely intact and undisturbed; and a large variety of habitat and resources for a range of native fauna available. Examples of threatened fauna that may utilise these habitats include Gang-gang Cockatoo, Glossy Black-cockatoo, Swift parrot *Lathamus discolor* and Regent Honeyeater *Xanthomyza Phrygia.*

Rock outcrops, with exfoliating sandstone sheets and small crevices, occur within the woodland habitat above the ephemeral creek line. These habitats provide refuge for a range of common reptile species including Blind Snake (*Ramphotyphlops nigrescens*), Southern Leaf-tailed Gecko (*Phyllurus platurus*) and Lesueur's Velvet Gecko (*Oedura lesueurii*).

Waterbodies

Two waterbodies are present within the study area, the Georges River and an unnamed tributary on the eastern side of the river. The Georges River is located within the northwest section of the study area and has been previously disturbed by road and bridge constructions. This section of the river largely consists of a rock platform with a small drainage line on the western side of the River (Plate 1 and 2). The river was not flowing at the time of the survey, although there were small isolated pools providing habitat for frog and reptile species.

The pools varied in size from smaller pools with no emergent vegetation (providing little shelter for frogs and reptile species), to large pools containing emergent vegetation such as *Typa sp.* This species is has been identified as one of the preferred habitat features for the threatened Green and Golden Bell Frog *Litoria auera* , however, given the presence of *Gambusia holbrooki* (predatory fish) it is unlikely the study area is optimum habitat for this species. The riparian vegetation mainly consists of shrubs including with *Kunzea ambigua, Dodonaea triquetra, Persoonia linearis* and *Acacia longifolia* with a good layer of leaf litter and scattered timber. The Georges River was considered to be in good condition with a high number of native plant species and a range of habitat resources for vertebrate fauna.

The unnamed tributary on the eastern side of the Georges River is ephemeral and was not flowing at the time of the survey. The tributary largely consists of a sandy substrate with scattered rock outcrops and native shrubs with a good cover of leaf litter and scattered timber. The riparian vegetation is consistent with the surrounding woodland habitat described above and the plant communities detailed in Section 4.2.2. The ephemeral drainage lines are often choked with debris such as scattered timber, bark and leaf litter providing potential habitat for reptiles and amphibians such as the Red-crowned Toadlet.

Despite previous activities the fauna habitat within the study area is considered to be in moderate condition with ground flora containing a high number of indigenous species; a dense understorey, log and litter layer largely intact; and a variety of habitat and resources for a range of native fauna available. However it is likely given the disturbance to the site that species more likely to inhabit these areas include introduced animals and natives tolerant of disturbance or favouring edge/ecotone habitat.

4.6 Fauna

Fauna utilising the study area were recorded from active searching and listening, as well as incidental observations. Fauna recorded in the current surveys are listed in Appendix 2 and include twenty-seven native bird species, nine mammals (two introduced), one amphibian and three reptiles.

The results from the Anabat detector identified five bat species (Table 2 Appendix 5), including the Southern Myotis, which is listed as Vulnerable on the TSC Act. In addition to this, one other threatened species was possibly recorded, however the analysis was unable to distinguish the call given the quality of recording and interference; hence this call could be any of three species (Eastern Broad-nosed Bat or Greater Broad-nosed Bat or Eastern False Pipistrelle, Table 2), as such all of these have been considered in this report.

Table 2: Results of Anabat surveys undertaken on the 16/1/2007

Bat No.	Scientific Name	Common name	Status
1	*Scotorepens orion* or *Scoteanax rueppellii* or *Falsistrellus tasmaniensis*	Eastern Broad-nosed Bat or Greater Broad-nosed Bat or Eastern False Pipistrelle	- V V
2	*Chalinolobus gouldii*	Gould's Wattle Bat	C
3	*Vespadelus darlingtoni*	Large Forest Bat	C
4	*Vespadelus vulturnus*	Little Forest Bat	C
5	*Myotis macropus*	Southern Myotis	V

Key: Listed on the TSC Act as Vulnerable (V), Common (C)

4.6.1 Significant Fauna

A total of 40 threatened or migratory animal species or their habitat have been previously recorded within the local area (Department of Environment and Conservation 2007, Department of the Environment and Heritage 2007) (Table 3). Of these, 35 animal species are listed under the TSC Act and 19 animal species listed under the EPBC Act. In addition one threatened bat species (Greater Broad-nosed Bat) listed on the TSC Act was possibly recorded within the study area (Section 4.6), and has not previously been recorded within the area (Department of Environment and Conservation 2007).

The study area contains potential habitat for 21 threatened and/or migratory species listed on the TSC and/or EPBC Act (Table 3).

Table 3: Terrestrial fauna listed on the TSC Act or EPBC Act that may occur in the local area

Scientific Name	Common Name	EPBC Act	TSC Act	Habitat	Potential habitat
Amphibians					
Litoria aurea	Green and Golden Bell Frog	V	E1	Found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes (NPWS 1999b). Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (White and Pyke 1996, NPWS 1999b).	Yes
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Occurs in wet and dry sclerophyll forests associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range (Barker *et al.* 1995). Prefers rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation (Barker *et al.* 1995). Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats.	No
Heleioporus australiacus	Giant Burrowing Frog	V	V	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks (Daly 1996, Recsei 1996). Can also occur within shale	No

Scientific Name	Common Name	EPBC Act	TSC Act	Habitat	Potential habitat
				outcrops within sandstone formations. In the southern part of its range can occur in wet and dry forests, montane sclerophyll woodland and montane riparian woodland (Daly 1996). Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water (Barker *et al.* 1995).	
Mixophyes balbus	Stuttering Frog	V	E1	This species is usually associated with mountain streams, wet mountain forests and rainforests (Barker *et al.* 1995). It rarely wanders very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on the banks of streams and are washed into the water during heavy rains (Barker *et al.* 1995).	No
Pseudophryne australis	Red-crowned Toadlet	-	V	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. These creeks are characterised after rain by a series of shallow pools lined by dense grasses, ferns and low shrubs (Thumm and Mahony 1996, Thumm and Mahoney 1997).	Yes
Birds					
Haliaeetus leucogaster	White-bellied Sea-eagle	M	-	A migratory species that is resident to Australia. Found in terrestrial and coastal wetlands; favoring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes (English and Predavec 2001).	No
Hirundapus caudacutus	White-throated Needletail	M	-	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges (Pizzey 1983).	No
Burhinus grallarius	Bush Stone-curlew	-	E1	Lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present (Marchant and Higgins 1993).	No
Callocephalon fimbriatum	Gang-gang Cockatoo	-	V	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997).	Yes
Calyptorhynchus lathami	Glossy Black-cockatoo	-	V	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types (NPWS 1999a) with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies (Higgins 1999). Breed in hollows stumps or limbs, either living or dead (Higgins 1999).	Yes
Climacteris picumnus	Brown Treecreeper	-	V	Live in eucalypt woodlands, especially areas of	No

Scientific Name	Common Name	EPBC Act	TSC Act	Habitat	Potential habitat
victoriae	(eastern subspecies)			relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present (Traill and Duncan 2000).	
Monarcha melanopsis	Black-faced Monarch	M	-	A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland (Pizzey 1983).	Yes
Rhipidura rufifrons	Rufous Fantail	M	-	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey 1983).	Yes
Melithreptus gularis gularis	Black-chinned Honeyeater	-	V	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts (Higgins *et al.* 2001). It is rarerly recorded east of the Great Dividing Range (Higgins *et al.* 2001).	No
Xanthomyza phrygia	Regent Honeyeater	E	E1	A semi-nomadic species occurring in temperate Eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forests associations and wet lowland coastal forests (Pizzey 1983, NPWS 1999c).	Yes
Pyrrholaemus sagittata	Speckled Warbler	-	V	This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy understorey, often on ridges or gullies (Blakers *et al.* 1984, NSW Scientific Committee 2001). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers *et al.* 1984, NSW Scientific Committee 2001). Home ranges vary from 6-12 hectares (NSW Scientific Committee 2001).	No
Stagonopleura guttata	Diamond Firetail	-	V	Found in a range of habitat types including open Eucalypt forest, mallee and acacia scrubs (Pizzey and Knight 1997).	No
Lathamus discolor	Swift Parrot	EM	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen an associated insects (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey 1983).	Yes
Neophema pulchella	Turquoise Parrot	-	V	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs (Morris 1980). Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies (Higgins 1999). Nest in hollow-bearing trees, either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies which are moist (Higgins 1999).	Yes
Rostratula australis	Australian Painted Snipe	V	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant &	No

Scientific Name	Common Name	EPBC Act	TSC Act	Habitat	Potential habitat
				Higgins 1993).	
Gallinago hardwickii	Latham's Snipe	M	-	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey and Knight 1997).	No
Ninox connivens	Barking Owl	-	V	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country (Pizzey 1983).	Yes
Ninox strenua	Powerful Owl	-	V	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within Red Turpentine in tall open forests and Black She-oak within open forests (Debus and Chafer 1994). Large mature trees with hollows at least 0.5 m deep are required for nesting (Garnett 1992). Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials (Gibbons and Lindenmayer 1997). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm (Gibbons and Lindenmayer 1997).	Yes
Invertebrates					
Meridolum corneovirens	Cumberland Plain Land Snail	-	E1	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge (NPWS 2000).	No
Mammals					
Cercartetus nanus	Eastern Pygmy-possum	-	V	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest (Turner and Ward 1995). Because of its small size it is able to utilise a range of hollow sizes including very small hollows (Gibbons and Lindenmayer 1997). Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5 month period (Ward 1990).	Yes
Dasyurus maculatus	Spotted-tailed Quoll	E	V	Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995).	No
Petrogale penicillata	Brush-tailed Rock-wallaby	V	E1	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices (Eldridge and Close 1995).	No

Scientific Name	Common Name	EPBC Act	TSC Act	Habitat	Potential habitat
Mormopterus norfolkensis	Eastern Freetail Bat	-	V	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species habits (Allison and Hoye 1995, Churchill 1998).	Yes
Isoodon obesulus	Southern Brown Bandicoot	E	E1	Prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time (Braithwaite 1995). A mosaic of post fire vegetation is important for this species (Maxwell *et al.* 1996).	Yes
Petaurus australis	Yellow-bellied Glider	-	V	Restricted to tall native forests in regions of high rainfall. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types (NPWS 1999d).	No
Petaurus norfolcensis	Squirrel Glider	-	V	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range (Suckling 1995). Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias (Quin 1995). There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps (Gibbons and Lindenmayer 1997). Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked (Menkhorst *et al.* 1988).	No
Phascolarctos cinereus	Koala	-	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall (Reed and Lunney 1990, Reed *et al.* 1990).	No
Potorous tridactylus	Long-nosed Potoroo	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy (Johnston 1995).	No
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost (Tidemann 1995) although some individuals may travel up to 70 km (Augee and Ford 1999).	Yes
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	-	V	This species uses a broad range of habitat including rainforest, wet and dry sclerophyll forest, paper bark forest and open woodland and grassland (Churchill 1998). The species is cave dweller (although some individuals occasionally roost in human constructed tunnels and buildings) (Strahan 1995, Churchill 1998).	Yes
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range (Hoye and Dwyer 1995). Can also be found on the edges of rainforests and in wet sclerophyll forests (Churchill 1998). This species roosts in caves and mines in	Yes

Scientific Name	Common Name	EPBC Act	TSC Act	Habitat	Potential habitat
				groups of between 3 and 37 individuals (Churchill 1998).	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	-	V	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high (Churchill 1998). Two observations have been made of roosts in stem holes of living eucalypts (Phillips 1995). There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor (Menkhorst and Lumsden 1995). This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites (Menkhorst and Lumsden 1995).	Yes
Myotis adversus	Soutrhern Myotis	-	V	Occurs in most habitat types as long as they are near permanent water bodies, including streams, lakes and reservoirs. Commonly roost in caves, but can also roost in tree hollows, under bridges and in mines (Richards 1995, Churchill 1998).	Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	-	V	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m (Churchill 1998)In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat (Hoye and Richards 1995). This species roosts in hollow tree trunks and branches (Churchill 1998).	Yes
Reptiles					
Hoplocephalus bungaroides	Broad-headed Snake	V	E1	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb 1996, Webb and Shine 1998).	No
Varanus rosenbergi	Rosenberg's Goanna	-	V	This species is a Hawkesbury/Narrabeen sandstone outcrop specialist (Wellington and Wells 1985). Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests (Cogger 1992).	Yes

Key: 1) Listed on the EPBC Act as Endangered (E) or Vulnerable (V) or covered under migratory provisions (M) on the EPBC Act
2) Listed on the TSC Act as Endangered (E1), Vulnerable (V)

5.0 IMPACT ASSESSMENT

Impact assessments were carried out on threatened biota that occur or have the potential to occur within the study area based on the presence of suitable habitat. It should be noted that this project is seeking approval under Part 3A of the EP&A Act, hence does not need to assess threatened species, populations and Endangered Ecological Communities listed on the TSC Act. For threatened biota listed on the EPBC Act which maybe impacted by the proposed development, EPBC Act Significant Impact Criteria are required to be considered. In the instance that the Significant Impact Criteria identifies that a significant impact on a species is likely, then a Referral to the Federal Minister for the Environment may be required.

5.1 Potential Impacts on Vegetation Communities

The following native vegetation communities will be disturbed by the proposed pipeline:

- Shale Sandstone Transition Forest, with approximately 0.06 ha directly impacted;
- Western Sandstone Gully Forest, with approximately 0.2 ha directly impacted; and,
- Exposed Sandstone Scribbly Gum Woodland, with approximately 0.2 ha directly impacted.

The area of direct impact of the proposed pipeline will generally be restricted to existing tracks and easements, with the exception of the Shale Sandstone Transition Forest within and adjoining the Appin Colliery Land and the Exposed Sandstone Scribbly Gum Woodland between Appin road and the powerline easement. Based on the vegetation mapping (Figure 3), approximately 0.5 ha of native vegetation will be directly impacted by the proposed pipeline. However, due to the scale of the NPWS (2002) mapping, finer scale disturbances within the study area, such as the existing track adjacent to Appin Road and the scattered trees in the Appin Colliery, are mapped as supporting native vegetation (Figure 3). It should be noted that the pipeline will not be requiring clearing of native vegetation in these areas, as it will remain within existing cleared areas. This is illustrated in Figure 2. Therefore, the areas of native vegetation required to be cleared for the proposed development are overestimates.

Indirect impacts of the proposed development may include erosion, sedimentation, weed invasion and edge effects. Approximately 1.3 ha of native vegetation will be indirectly impacted by the proposed development. These

impacts will be minimised through mitigation measures such site rehabilitation as erosion and sedimentation controls (detailed in section 6.0).

Approximately 13,365 ha of native vegetation has been mapped by DEC and Biosis Research as occurring in the local area (10 km radius of study area), with approximately:

- 8,756 ha of Exposed Sandstone Scribbly Gum Woodland;
- 3028 ha of Shale Sandstone Transition Forest (High Sandstone Influence); and,
- 1518 ha of Western Sandstone Gully Forest.

It is unlikely that impacting a total of approximately 1.7 ha of native vegetation, including approximately 1.3 ha of indirect impacts, will result in a significant impact on the vegetation of the local area. Furthermore, suitable mitigation measures (see section 6.0) are likely to reduce the indirect impacts on the ecological values within the study area.

5.1.1 Endangered Ecological Communities

The proposed development will impact on Shale Sandstone Transition Forest (SSTF), an EEC listed on both the TSC and EPBC Acts. SSTF in the study area was considered to be in moderate condition, impacted by weed invasion and had a modified structure due to existing land use.

As detailed above, the proposal will result in the removal of approximately 0.06 ha of SSTF, with a further 0.1 ha being indirectly impacted. This is likely to be an over estimate, given that the area within the Appin Colliery supporting scattered trees over a mown grassy understorey is incorrectly mapped as SSTF (Figures 2 and 3). There is approximately 3,028 ha of SSTF mapped as occurring in the local area (10 km radius of the study area). Therefore, the proposal will impact on less than 0.01% of SSTF in the local area. Furthermore, mitigation measures, such as site rehabilitation and sedimentation and erosion controls will minimise the indirect impacts on SSTF in the study area.

The patch of SSTF that will be disturbed as part of the proposed development is a relatively fragmented patch surrounded by the Appin Colliery and Appin Road. The proposed development will temporarily fragment the small patch of SSTF, however mitigation will include rehabilitation of the disturbed area. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with Appin Colliery and Appin Road. The proposal is not likely to result in the permanent isolation of any areas of SSTF.

Significant Impact Criteria under the EPBC Act were used to assess the impact of the proposed development on SSTF (Appendix 4). It was found that the proposed development is not likely to have a significant impact on SSTF and, as such, a Referral under the EPBC Act is not recommended.

5.2 Potential Impacts on Flora

Native plant species that will be impacted by the proposed development are generally restricted to common sandstone and shale species. Impact to trees should be minimised through avoiding clearing trees where possible. Natural regeneration of disturbed areas should be encouraged through bush regeneration techniques such as brush matting and spreading of any cleared native biomass back over the cleared area once works are completed. Regeneration of native plant species within the cleared areas will reduce fragmentation of habitats in the area. Techniques to minimise the impact of the proposed works on native flora of the area is further discussed in the Recommendations section (Section 6.0).

5.2.1 Potential Impacts on Threatened Plant Species

No threatened plant species were recorded within the study area, however, potential habitat exists in the study area for five threatened plant species: *Acacia bynoeana,, Grevillea parviflora* spp. *parviflora, Persoonia hirsuta* and *Pultenaea aristata.*

Impacts on potential habitat for threatened plant species can be minimised through sedimentation and erosion controls, restrictions on landscaping, and bush regeneration techniques, as discussed in the Recommendations section (Section 6.0).

Acacia bynoeana

Acacia bynoeana was not recorded in the study area, but is known to occur in the local area, with one record occurring to the south-east of the study area (Figure 4).

Potential habitat for *Acacia bynoeana* exists in Exposed Sandstone Scribbly Gum Woodland (ESSW) within the powerline easement and track margins along the ridgetop in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.2 ha of this vegetation community will be directly impacted by the proposed works, with a further 0.7 ha indirectly impacted. Approximately 8,756 ha of ESSW are mapped as occurring in the local area. Therefore, the impacted area equates to 0.01% of similar potential habitat for the species in the local area.

The proposed works will result in temporary fragmentation of potential habitat for this species. However, the pipeline will be installed underground through ESSW and the area will be regenerated once works have been completed. It should also be noted that this species prefers open, sometimes slightly disturbed sites (DEC 2005a), therefore it is unlikely that the temporary disturbance to this area will adversely impact this species.

Acacia bynoeana is listed as Vulnerable on the EPBC Act, therefore Significant Impact Criteria under the EPBC Act were used to assess the impact of the proposed development on *Acacia bynoeana* (Appendix 4). It was found that the proposal is not likely to have a significant impact on *Acacia bynoeana* and, as such, a Referral under the EPBC Act is not recommended.

Grevillea parviflora* spp. *parviflora

Grevillea parviflora spp. *parviflora* was not recorded in the study area, but is known to occur in the local area, with 8 known records occurring within a 10 km radius of the study area (Figure 4).

Potential habitat for *Grevillea parviflora* spp. *parviflora* exists in SSTF and ESSW in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.3 ha of these vegetation communities will be directly impacted by the proposed development, with a further 0.8 ha indirectly impacted. This is a relatively small portion (less than 0.01%) of similar potential habitat in the local area, with 3,028 ha of SSTF and 8,756 ha of ESSW mapped as occurring within a 10 km radius of the study area.

Part of the impacted area mapped as SSTF within the Appin Colliery land (Figure 3) is represented by scattered trees over an exotic mown understorey, and is therefore not considered to represent SSTF. There is a small patch of SSTF in moderate condition within and immediately adjoining the Appin Colliery land that will be directly impacted by creation of a trench to install the proposed pipeline. This area will be regenerated once the installation of the pipeline is complete, following recommendations in Section 6.0.

Grevillea parviflora spp. *parviflora* is listed as Vulnerable under the EPBC Act. Significant Impact Criteria under the EPBC Act has been undertaken for this species (Appendix 4). It was found that the proposal is not likely to have a significant impact on *Grevillea parviflora* spp. *parviflora* and, as such, a Referral under the EPBC Act is not recommended.

Persoonia hirsuta

Persoonia hirsuta was not recorded in the study area, but is known to occur in the local area, with numerous records occurring to the east and north of the study area (Figure 4). There is a large population of this species known to occur at West Cliff, immediately adjoining the study area.

Potential habitat for *Persoonia hirsuta* occurs in Exposed Sandstone Scribbly Gum Woodland and Shale Sandstone Transition Forest in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.3 ha of these vegetation communities will be directly impacted by the proposed pipeline, with an additional 0.8 ha being indirectly impacted. This is a relatively small proportion of similar habitats in the local area, with 8,756 ha of ESSW and 3,028 ha of SSTF mapped as occurring in the local area.

Clearing will be restricted to existing tracks and powerline easements where possible. Where clearing of native vegetation is required, mitigation measures, such as rehabilitation, weed management and sedimentation and erosion controls, will reduce the direct and indirect impact on the native vegetation of the area.

Persoonia hirsuta is listed as Endangered under the EPBC Act. Significant Impact Criteria under the EPBC Act has been undertaken for this species (Appendix 4). It was found that the proposal is not likely to have a significant impact on *Persoonia hirsuta* and, as such, a Referral under the EPBC Act is not recommended.

Pultenaea aristata

Pultenaea aristata was not recorded in the study area, but is known to occur in the local area, with two previous recordings of the species within a 10 km radius of the study area, including one recording along the Georges River in close proximity of the study area (Figure 4). A population of this species has also recently been recorded by Biosis Research in the neighbouring West Cliff site and the Dharawal State Conservation Area.

Potential habitat for *Pultenaea aristata* in the study area occurs in WSGF and ESSW. The proposal will remove or modify approximately 0.4 ha of vegetation that is potential habitat for *Pultenaea aristata,* with a further 1.1 ha being indirectly impacted.

At least 8,756 ha of Exposed Sandstone Scribbly Gum Woodland has been mapped in the locality (within 10 km of the study area) by DEC (NPWS 2003a). In addition, approximately 1,581 ha of WSGF has been mapped as occurring in the local area. The area of habitat to be removed as part of the proposal equates to approximately 0.01% of similar vegetation that exists in the locality. This is likely to be an overestimate, given that the majority of the direct impacts will be restricted to existing cleared tracks within the area mapped as WSGF.

Indirect impacts will be minimised through mitigation measures such as erosion and sedimentation controls, site rehabilitation and weed control.

Pultenaea aristata is listed as Vulnerable on the EPBC Act. Significant Impact Criteria under the EPBC Act has been undertaken for this species (Appendix 4). It was found that the proposal is not likely to have a significant impact on *Pultenaea aristata* and, as such, a Referral under the EPBC Act is not recommended.

5.3 Potential Impacts on Fauna Habitats

The proposed development is likely to have a direct and indirect impact on fauna habitats within the study area. The main impacts from the proposal include clearing of vegetation, erosion and siltation and bushrock removal, these impacts are discussed in more detail below.

Clearing of Vegetation

Land clearing is listed as KTP on the EPBC Act (also on the TSC Act) and consists of the destruction of the above ground biomass of native vegetation including clearance of native vegetation for crops, improved, pasture, plantations, gardens, houses, mines, buildings and roads.

A total of 1.8 ha (0.5 ha direct and 1.3 ha from indirect impacts) of vegetation will be cleared for the construction of the proposed pipeline. Over much of the route vegetation clearing would occur in areas that are already highly disturbed (e.g. along the current easements), offering few fauna habitat features. In other areas however, vegetation removal would be more significant, impacting upon relatively intact native vegetation. This is evident in the Woodland habitat between Appin road and the powerline easement where approximately 0.2 ha of Exposed Sandstone Scribbly Gum Woodland is likely to be removed. This would include removing and/ or modifying finer scale habitat features such as tree hollows, scattered timber and rocky outcrops. However these habitat features are widely represented within the local area (approximately 13,365 ha) and with suitable mitigation measure such as site rehabilitation it is unlikely that the

removal of 0.2 ha would have a significant impact on the Woodland habitat within the study area.

Impacts of vegetation clearing can be both direct and indirect. Direct impacts result in the loss of plant species and fauna habitat features that occur in the area. In the current study area this would include nesting habitat and roosting hollows, as well as feeding and shelter resources. Indirect impacts include the increase in edge effects in adjoining vegetation and changes in run off patterns. Approximately 1.3 ha of Woodland habitat is likely to be indirectly impacted by the proposed development. Given the abundance of Woodland Habitat within the local area (approximately 13,365 ha) it is unlikely that the proposal would have a significant impact on fauna habitats within the local area. Furthermore with suitable mitigation measures (see Section 6) during the construction and operation phases of the development, such as sedimentation controls are likely to reduce the indirect impacts on the ecological values within the study area.

Erosion and siltation

Erosion and siltation can result from vegetation clearing, track upgrade and widening, physical effects of frequent vehicle movements and soil disturbance from construction. The potential impact of erosion (or slumping) and subsequent sedimentation within waterways is expected to be greater in unstable areas or where run off and rainfall are high the potential for erosion increases. These issues are important considerations for the Georges River and unnamed tributary. However with suitable mitigation measures, such as sedimentation control devices implemented during the construction and operation phase of the development impacts on the waterways should be minimised.

Bushrock removal

Bushrock Removal removes and/or disturbs habitat of native species, which may find shelter in or under rocks, may use rocks for basking, or which grow in rocky areas. Sections of exposed rock outcrop, including rock on rock formations, may be required to be removed near the Georges River and between the Appin Road and powerline easement within the Woodland habitat. This action may impact those species reliant on these finer habitat features, such as the Lesueur's Velvet Gecko (*Oedura lesueurii*) and the Threatened Red-crowned Toadlet. However given the extent of these habitat features within the study area and mitigation measures (see Section 6) it is unlikely that the proposed development would have a significant impact on this habitat.

5.4 Potential Impacts on Threatened Fauna

Where there is potential habitat (foraging or breeding resources) for threatened species in the study area, further consideration must be given to the potential impact of the proposed development on these species. The proposed works may impact threatened species by resulting in any of the following situations arising:

- death or injury of individuals;
- loss or disturbance of limiting foraging resources; and/or
- loss or disturbance of limiting breeding resources.

Limiting resources are specialised habitat components that species are dependent on for their ongoing survival. Such limiting resources are predominantly associated with specialised breeding habitats (such as tree hollows or suitable nest/maternity roost sites) that occur at low densities, with high levels of competition from a range of species. However, for some species, limiting resources include specialised foraging habitats that have a restricted distribution (such as Koalas feeding only on specific tree species).

Actual or potential habitat exists within the study area for a total of 19 threatened animals species listed on the TSC Act and /or EPBC Act identified in Table 2.

Amphibians

Potential habitat for two threatened frog species, the Red-crowned Toadlet and Green Golden Bell Frog is likely to occur within study area. The Red-crowned Toadlet is listed as Vulnerable on the TSC Act and potential habitat for this species occurs within the unnamed tributary and surrounding Woodland habitat. The proposal is likely to have direct and indirect impacts on these habitat features, resulting in the loss of potential breeding habitat for the Red-Crowned Toadlet. However, given the extent of finer scale habitat features within the local area and suitable mitigation measures it is unlikely the proposed development would have a significant impact on the Red-Crowned Toadlet habitat.

The Green and Golden Bell Frog are listed as Endangered on the TSC Act and Vulnerable on the EPBC Act. Potential habitat for this species occurs along the Georges River. The proposed development is likely to indirectly impact this habitat due to erosion and siltation. However, given the presence of the predatory fish *Gambusia holbrooki* it is unlikely that this species would occur within the study area. Furthermore, if this species is present, implementation of suitable mitigation measures such as sedimentation controls are likely to minimise the impacts on the potential habitat. As such Significant Impact Criteria under the EPBC Act has not been undertaken for this species

Birds

Potential habitat for eight threatened bird species (including four species listed on the EPBC Act) occurs in Woodland habitat within study area. The proposed works would involve clearing of this habitat (approximately 1.8 ha of native vegetation) and the loss of potential foraging and breeding resources for these bird species. Given the mobility of these bird species and larger areas of continuous woodland habitat (approximately 13,365 ha; NPWS, 2004) within the study area it is unlikely that the proposed works would have a significant impact on any limiting habitat. Furthermore, the study area will be rehabilitated once the proposed works have been completed. As such Significant Impact Criteria under the EPBC Act has not been undertaken for those four species listed under on the EPBC Act (Black-faced Monarch, Rufous Fantail, Regent Honeyeater and Swift Parrot).

Mammals

Potential habitat for nine threatened mammals (Table 3) has been identified in the Woodland habitat within the study area. Three of these species, Grey-headed Flying Fox, Southern Brown Bandicoot and Large-eared Bat are listed on the EPBC Act.

The proposed clearing of approximately 1.8 ha of potential habitat may reduce the availability of nesting and foraging resources for these species. However these habitat features are widely represented within the local area, hence it is unlikely that the proposed works would have a significant impact on the Woodland habitat. As such Significant Impact Criteria under the EPBC Act has not been undertaken for those species (Grey-headed Flying Fox, Southern Brown Bandicoot and Large-eared Bat) listed on the EPBC Act. Furthermore, with suitable mitigation measures such as controlled clearing and rehabilitation post works, any potential impacts will be further reduced.

The results from the Anabat detector identified five bat species (occurring within the study area (Table 2) including the Southern Myotis, which is listed as Vulnerable on the TSC Act. The Southern Myotis occurs near permanent water bodies, including streams, lakes and reservoirs. Potential habitat for this species occurs along the Georges River and in the Woodland habitat within the study area. Given the small area of impact, extent of similar habitat in the local area and mitigation measures it is unlikely that the proposed works would have a significant impact on these habitats.

In addition to the Southern Myotis, one other threatened species was also possibly recorded, however the analysis was unable to distinguish the bat call due to the quality of the recording and interference. It was therefore difficult to determine whether the species was Greater Broad-nosed Bat or Eastern False

Pipistrelle. Both of these species are likely to occur in the Woodland habitat within the study area and require similar habitat features such as tree hollows to survive. These features are widely represented in the study area and local area; hence it is unlikely the proposed works would have a significant impact on the Woodland habitat. No assessments of significance have been prepared for any of these bats (Southern Myotis, Greater Broad-nosed Bat or Eastern False Pipistrelle), as they are listed on the TSC Act and therefore not considered under a Part 3A application.

Reptiles

Potential habitat for Rosenberg's Goanna occurs within the Woodland habitat. Given the extent of continuous Woodland, the loss of 1.8 ha of habitat is unlikely to have long-term negative consequences for the species local occurrence.

6.0 MITIGATION MEASURES

The proposed works are unlikely to have a significant impact on biota, however, it is recommended that the following mitigation measures be taken into consideration to minimise any disturbances on the ecological values of the study area:

Vegetation Clearing

In order to mitigate some of the impacts of vegetation clearing it is recommended that:

- Vegetation clearing is restricted to those areas where it is necessary;
- Where clearing does occur, the area should be marked to ensure that clearing does not extend beyond the area necessary;
- where possible trees should be retained, particularly those with hollows;
- Vegetation within the road reserve and adjacent to areas of vegetation clearing should be managed to reduce invasion of noxious weed species, this may include controlling weeds at their point of source (ie. the area of clearing).

Edge Effects

Mitigation measures for edge effects relate generally to reducing impacts outside of the direct development zone, controlling possible impacts at their source within the study area and reducing the hardness of the edge between the extent of earthworks and native vegetation. Measures that are relevant to the current proposal include:

- Minimising disturbance to habitat adjacent to construction (eg. the use of visible temporary fencing);
- Minimising disturbance wherever possible to stream banks and streambeds;
- Where possible, siting all ancillary building and works in cleared or otherwise disturbed areas away from waterways and other sensitive areas;
- Avoiding stockpiling materials on adjacent vegetation;
- Restricting access into sensitive areas such as drainage lines;
- Managing general construction activities to appropriately dispose of waste material and/or contaminants away from adjacent habitats;

- Implement sediment/erosion and drainage control devices should be utilised during and after excavation works in order to prevent sediment laden run off and erosion impacting adjoining bushland areas and the Georges River;
- Disposing of materials and contaminants as per statutory requirements (*Protection of the Environment Operations Act*) in appropriate waste disposal or landfill sites;
- Care should be taken during construction to minimise disturbance to native vegetation and to avoid spreading exotic species propagules into the adjoining vegetation;
- Landscaping or rehabilitation works should use local native species; bush regeneration techniques such as brush matting, spread of cleared native biomass over disturbed areas and weed control should be used to encourage native regeneration, and,

Weeds

A number of recommendations should be implemented to reduce the impact of weed invasion on native vegetation communities:

- Restrict the area of native vegetation disturbed during construction works;
- Restrict stockpiling to areas already cleared of vegetation;
- Control drainage that may contain weed seeds or high levels of nutrients;
- Use weed-free topsoil in landscaping and revegetate disturbed sites with locally indigenous species. In areas where vegetation to be cleared is in good condition, topsoil may be stockpiled and used for revegetation following the completion of construction works. Generally native vegetation remnants within the study area are in good-moderate condition however, soil (seedbank) stockpiling should be restricted to areas in good-moderate condition, avoiding disturbed areas such as road margins. Revegetation using stockpiled soil should also include planting local native species to stabilise the soil as well as ongoing weed control; and,
- All vehicles and machinery entering the construction zone need to be clear of material that could be contaminated with weed propagules and must be washed down to minimise the potential for weed spread.

7.0 CONCLUSION

No threatened flora were recorded in the study area. The study area supports Shale Sandstone Transition Forest, an Endangered Ecological Community listed under the TSC Act and EPBC Act. The proposed pipeline will impact on this vegetation community, with the pipeline route traversing a small patch in moderate condition. In addition, the proposed pipeline will impact on potential habitat for a number of threatened flora: *Acacia bynoeana, Epacris purpurescens* var. *purpurescens, Grevillea parviflora* spp. *parviflora, Persoonia hirsuta* and *Pultenaea aristata.* Significant Impact Criteria under the EPBC Act were carried out for those threatened plant species and ecological communities with potential habitat in the study area that are listed under the EPBC Act. It was found that the proposed development was not likely to have a significant impact on threatened plant species and ecological communities listed under the EPBC Act and, as such, a Referral under the EPBC Act is not recommended.

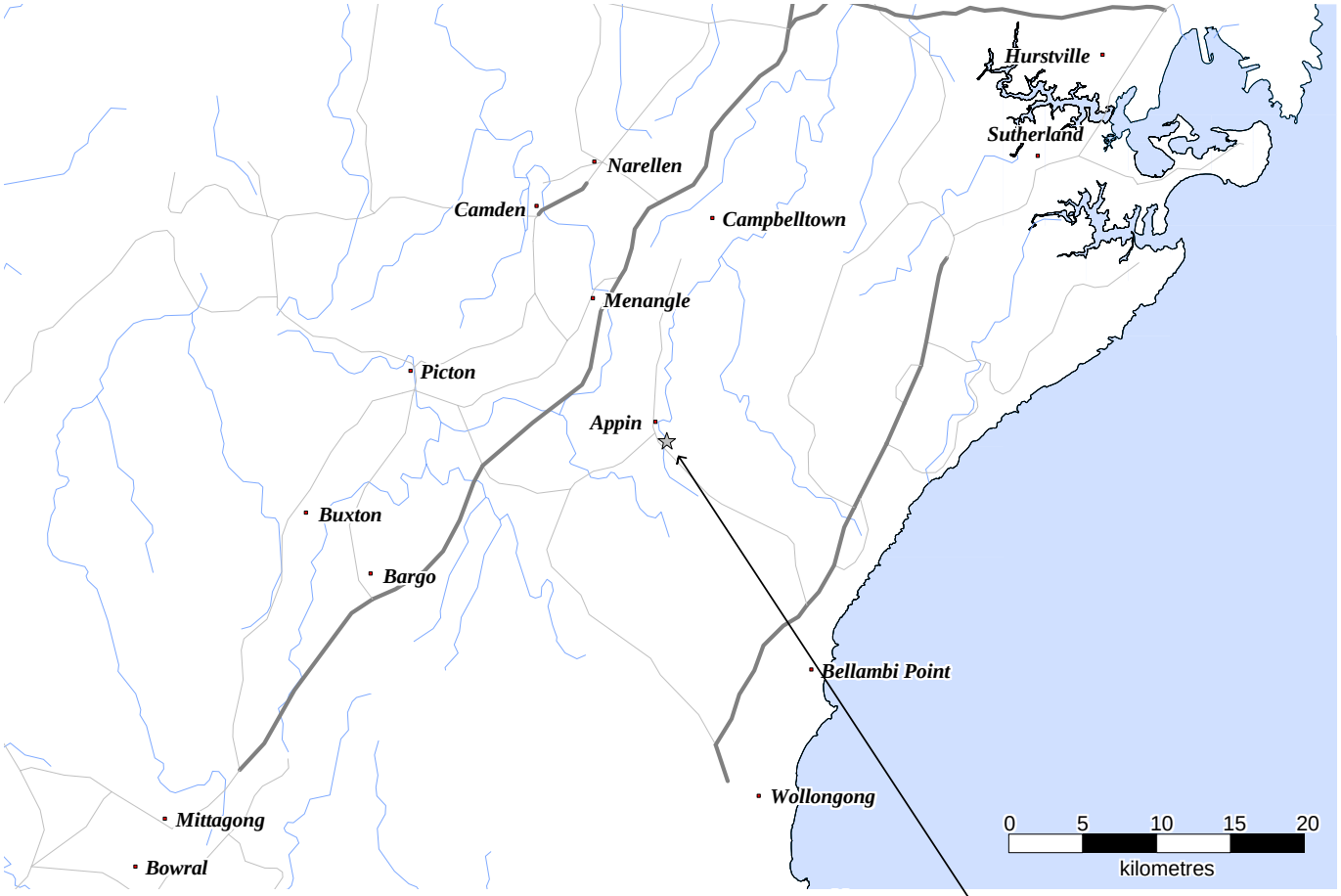
The proposed works are likely to remove or modify potential breeding and foraging resources for 19 threatened animal species Green and Golden Bell Frog, Red-crowned Toadlet, Gang- gang Cockatoo, Glossy Black-cockatoo, Black-faced Monarch, Rufous Fantail, Regent Honeyeater, Swift Parrot, Turquoise Parrot, Barking Owl, Powerful Owl, Eastern Pygmy-possum, Eastern Freetail Bat, Southern Brown Bandicoot, Grey-headed Flying-fox, Eastern Bent-wing Bat, Large-eared Pied Bat, Eastern False Pipistrelle, Large-footed Myotis, Broad-headed Snake and Rosenberg's Goanna. However, habitat features for these species are considered to be widely represented within the local area, hence it is unlikely the proposed works would result in the loss or disturbance of limiting foraging resources; and/or loss or disturbance of limiting breeding resources for these species. Furthermore with suitable mitigation measure such as site rehabilitation and sedimentation control devices, impacts on the fauna habitats will be minimised.

Based on the results from the Anabat one threatened bat species was recorded within the study area, .In addition another bat species was recorded which may also be threatened. Due to the quality of the recording and interference it was difficult to determine whether the call was a Eastern Broad–nosed Bat, Greater Broad-nosed Bat or Eastern False Pipistrelle. All of the bat species are likely to use the Woodland habitat within the study area and require similar habitat features such as tree hollows/caves to survive. These features are widely represented in the study area and local area; hence it is unlikely that the proposed works would have a significant impact on the Woodland habitat. No assessments of significance have been prepared for these species as they are listed on the TSC Act therefore not considered under a Part 3A application.

The proposed works are unlikely to have a significant impact on threatened species, endangered ecological communities or populations, however, recommendations to minimise any disturbances and indirect impacts on the ecological values have been provided in section 6.0.

In addition it should be noted that although this proposal is being assessed under Part 3A of the EP&A Act, hence assessments of significance under the TSC Act are not required, impacts on potential habitat for threatened species listed on the TSC Act was, however, considered and also deemed insignificant given the small area of impact and the extensive quantity of similar habitat types in the local area.

FIGURES



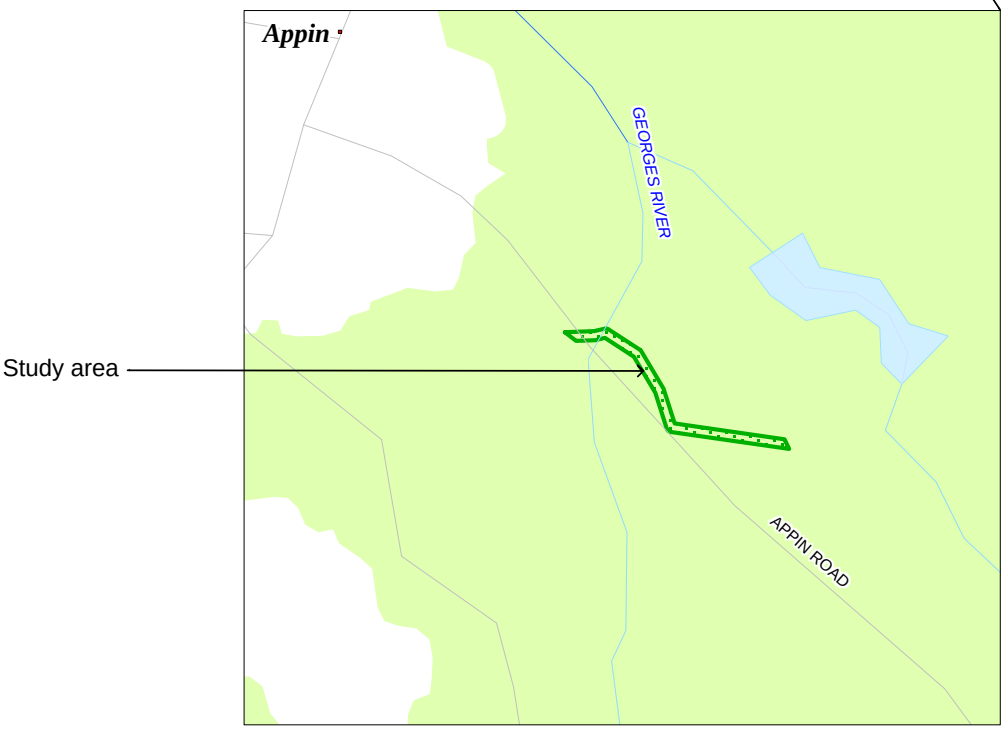


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Figure 1: Location of the Study Area in a regional context.

DATE: 26 February 2007

Checked by: TE | File number: S4640

Location:-...4000\4600s\4640\Mapping\S4640 F1_locality.WOR

Scale: 0 0.25 0.5 0.75 1.0 kilometres

N W E S

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Figure 2: Proposed West Cliff to Appin pipeline layout

DATE: 26 February 2007

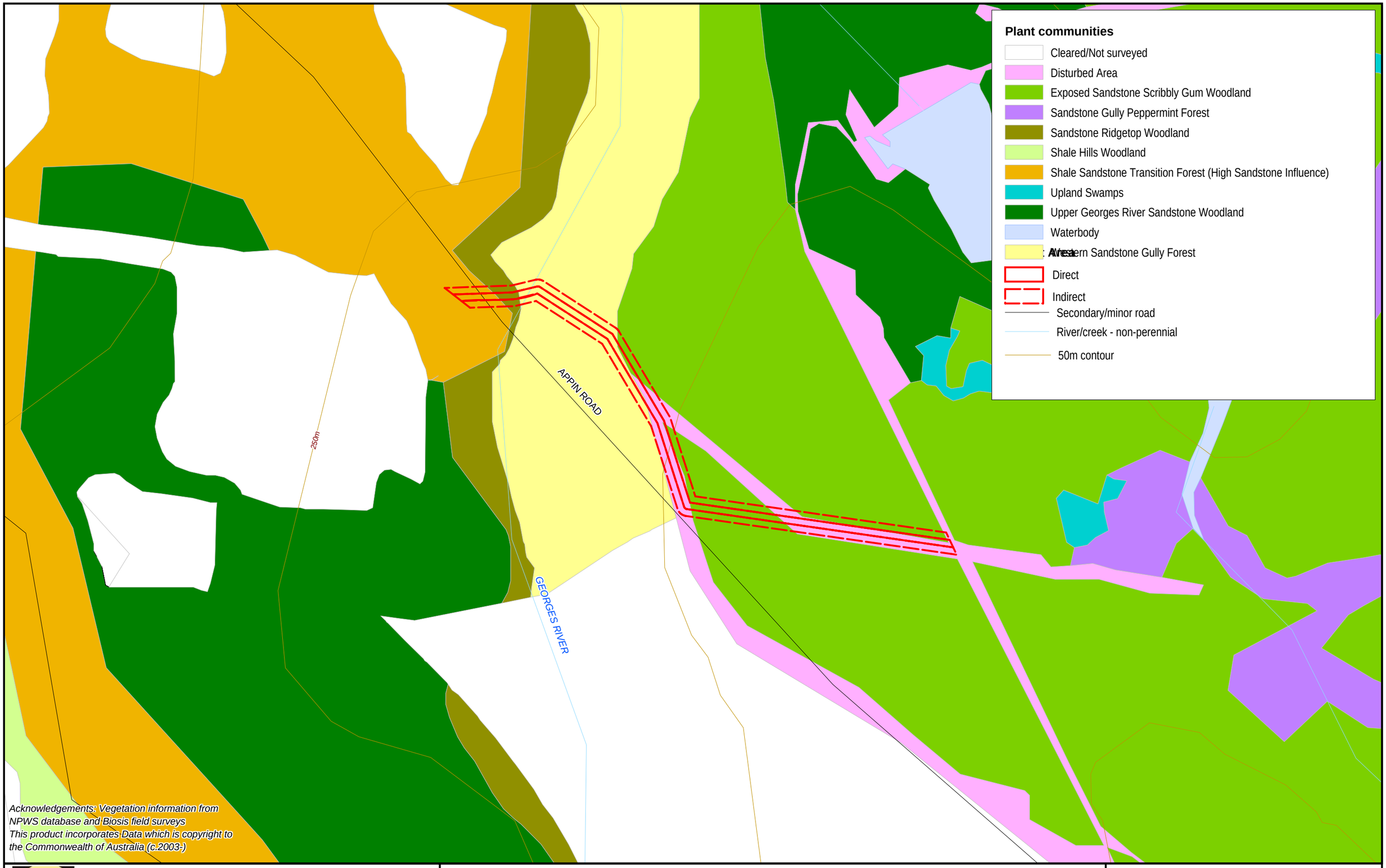
Checked by: TE/SQM | File number: S4526

Location:-..4000\4600s\4640\Mapping\S4640 F2_layout.WOR

Scale: 0 25 50 75 100 125 metres

N W E S

Figure 2: Proposed West Cliff to Appin pipeline layout



Acknowledgements: Vegetation information from NPWS database and Biosis field surveys
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Figure 3: Plant communities within the Study Area.

DATE: 26 February 2007
Checked by: TE
File number: S4640
Location:-..4000\4600s\4640\Mapping\S4640 F3_veg.WOR

Scale: 0 50 100 150 200 250 metres

N W E S

Figure 3: Plant communities within the Study Area.

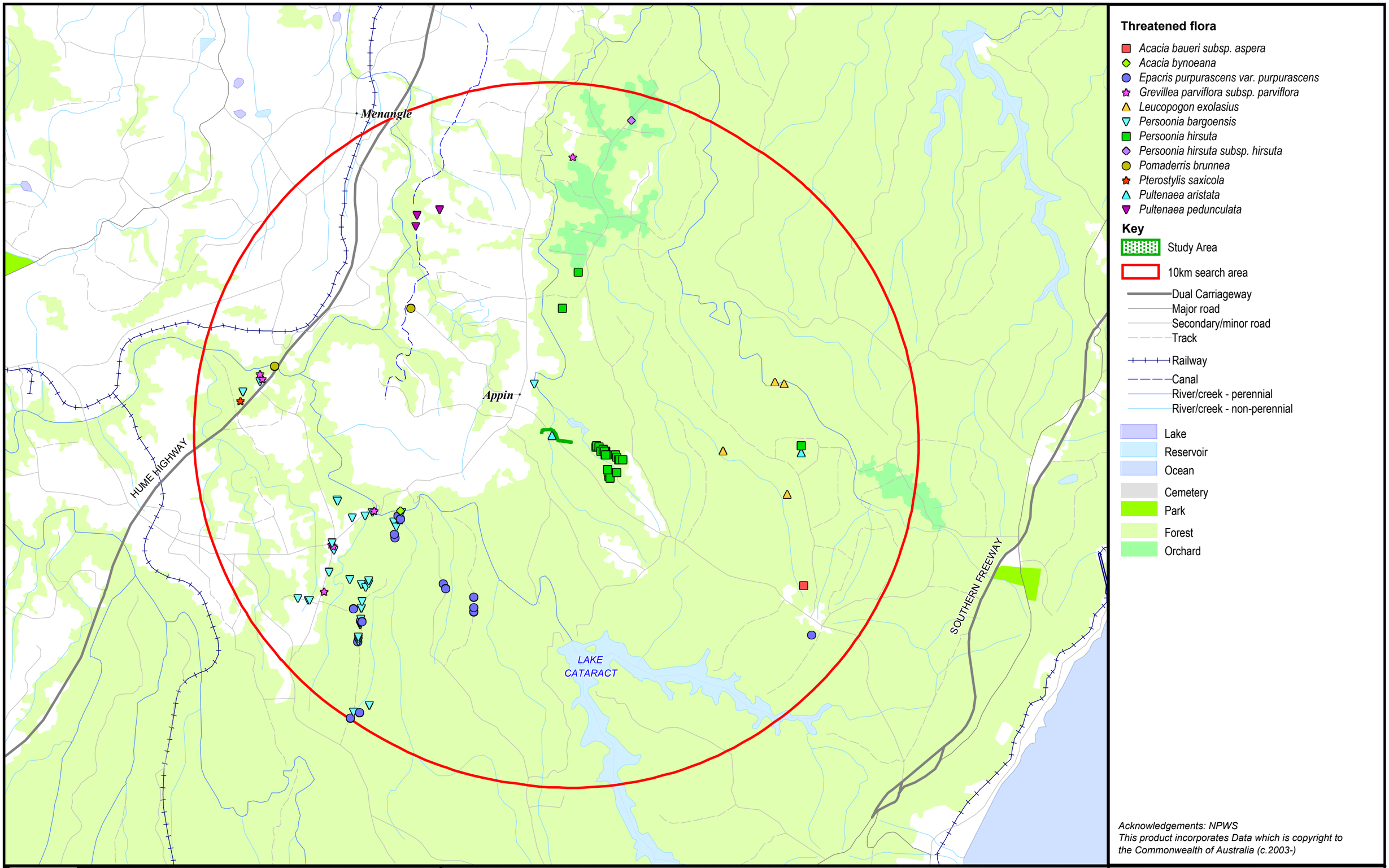

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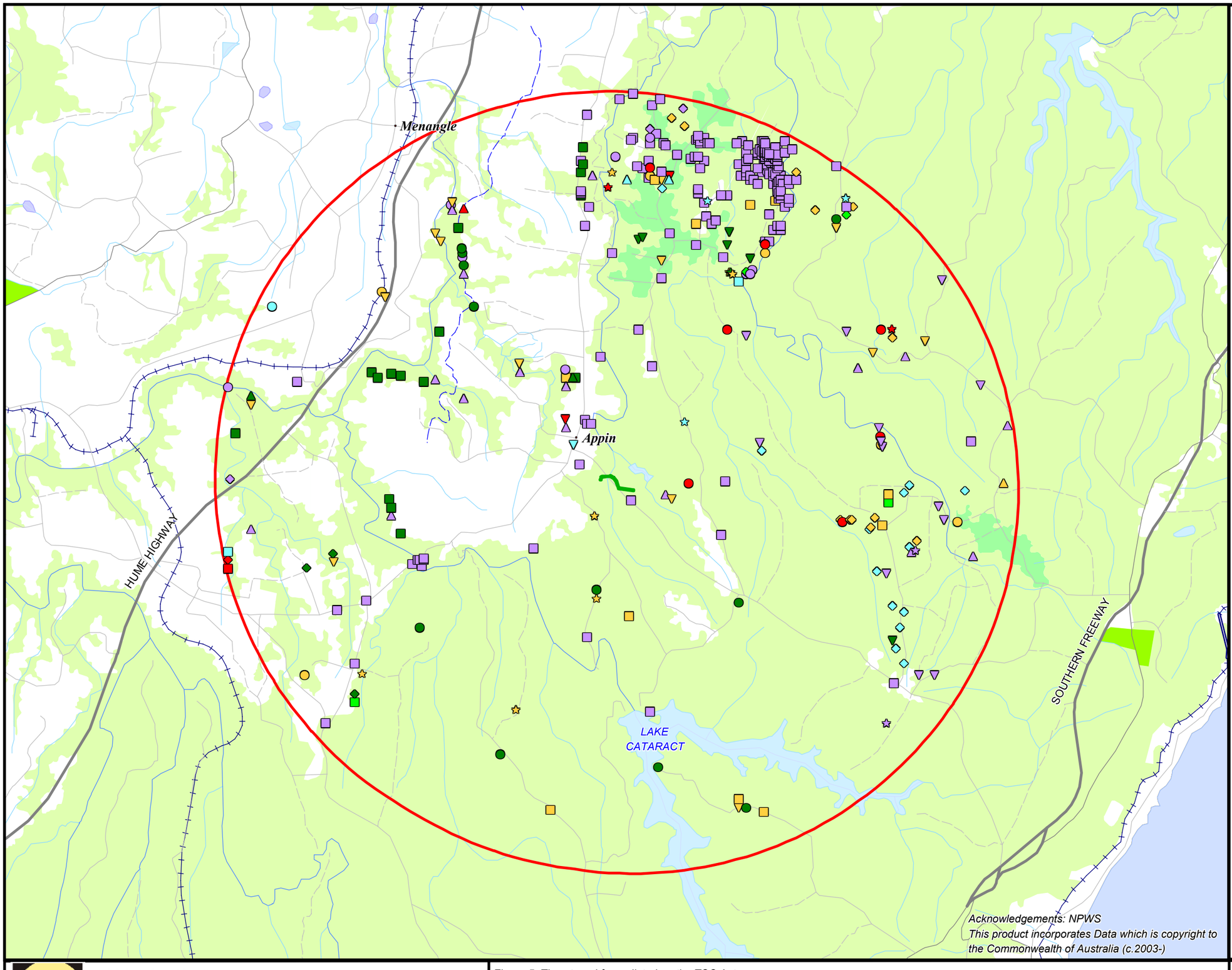
Figure 4: Threatened flora listed on the TSC Act, recorded witthin 10km of the Study Area.

DATE: 22 January 2007
Checked by: TE
File number: S4640
Location:-..4000\4600s\4640\Mapping\S4640 F4_flora.WOR

Scale: 0 1 2 3 4 5 kilometres

N W E S

Figure 4: Threatened flora listed on the TSC Act, recorded witthin 10km of the Study Area.



Threatened fauna

- Barking Owl
- Black-chinned Honeyeater (eastern subspecies)
- Broad-headed Snake
- Brown Treecreeper
- Brown Treecreeper (eastern subspecies)
- Bush Stone-curlew
- Cumberland Plain Land Snail
- Diamond Firetail
- Eastern Bentwing-bat
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Eastern Pygmy-possum
- Gang-gang Cockatoo
- Giant Burrowing Frog
- Glossy Black-Cockatoo
- Greater Broad-nosed Bat
- Green and Golden Bell Frog
- Grey-headed Flying-fox
- Koala
- Large-eared Pied Bat
- Large-footed Myotis
- Littlejohn's Tree Frog
- Powerful Owl
- Red-crowned Toadlet
- Regent Honeyeater
- Rosenberg's Goanna
- Speckled Warbler
- Spotted-tailed Quoll
- Squirrel Glider
- Swift Parrot
- Turquoise Parrot
- Yellow-bellied Glider

Key

- Study Area
- 10km search area
- Dual Carriageway
- Major road
- Secondary/minor road
- Track
- Railway
- Canal
- River/creek - perennial
- River/creek - non-perennial
- Lake
- Reservoir
- Ocean
- Cemetery
- Park
- Forest
- Orchard

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15 - 17 Henrietta Street
Chippendale
NEW SOUTH WALES 2008

Figure 5: Threatened fauna listed on the TSC Act, recorded withtin 10km of the Study Area.

DATE: 22 January 2007
Checked by: TE
File number: S4640
Location:-..4000\4600s\4640\Mapping\S4640 F5_fauna.WOR

Scale: 0 1 2 3 4 5 kilometres

N W E S

Figure 5: Threatened fauna listed on the TSC Act, recorded withtin 10km of the Study Area.

PLATES

Plate 1: Georges River and Kings Fall Bridge

Plate 2: Georges River, showing pools of water upstream of Kings Falls Bridge

Plate 3: Patch of Shale Sandstone Transition Forest adjoining Colliery Land

Plate 4: Track parallel to Appin Road, with disturbed road batters and Exposed Sandstone Scribbly Gum Woodland

Plate 5: Small gully supporting Exposed Sandstone Scribbly Gum Woodland

Plate 6: Vegetation underneath powerline easement

APPENDICES

APPENDIX 1

Flora Results

Family		Scientific name	Common name
Ferns and Fern-like Plants			
Dennstaedtiaceae			
		Pteridium esculentum	Bracken
Gleicheniaceae			
		Gleichenia dicarpa	Pouched Coral-fern
Monocotyledons			
Asparagaceae			
	*	*Asparagus asparagoides*	Bridal Creeper
Cyperaceae			
		Cyathochaeta diandra	Sheath Sedge
		Lepidosperma filiforme	Common Rapier-sedge
		Lepidosperma laterale	Variable Sword-sedge
		Lepidosperma urophorum	Tailed Rapier-sedge
		Schoenus apogon	Fluke Bogrush
Iridaceae			
		Patersonia glabrata	Leafy Purple-flag
		Patersonia sericea	Silky Purple-flag
Lomandraceae			
		Lomandra filiformis ssp. *coriacea*	Wattle Mat-rush
		Lomandra longifolia	Spiny-headed Mat-rush
		Lomandra multiflora ssp. *multiflora*	Many-flowered Mat-rush
		Lomandra obliqua	
Phormiaceae			
		Dianella caerulea var. *producta*	Blue Flax-lily
		Dianella revoluta var. *revoluta*	
Poaceae			
		Anisopogon avenaceus	Oat Speargrass
		Austrodanthonia tenuior	Purplish Wallaby-grass
		Austrostipa pubescens	
	*	*Briza maxima*	Quaking Grass
	*	*Bromus catharticus*	Prairie Grass
		Cynodon dactylon	Common Couch
		Echinopogon ovatus	Forest Hedgehog Grass
		Entolasia marginata	Bordered Panic
		Entolasia stricta	Wiry Panic
		Eragrostis brownii	Brown's Lovegrass
	*	*Eragrostis curvula*	African Lovegrass
		Imperata cylindrica var. *major*	Blady Grass
		Microlaena stipoides var. *stipoides*	Weeping Grass
		Panicum simile	Two-colour Panic
	*	*Paspalum urvillei*	Vasey Grass
	*	*Pennisetum clandestinum*	Kikuyu Grass
		Phalaris spp.	
	*	*Setaria gracilis*	Slender Pigeon Grass
		Themeda australis	Kangaroo Grass
Restionaceae			
		Baloskion gracile	

Family		Scientific name	Common name
		Lepyrodia scariosa	
Typhaceae			
		Typha spp.	
Dicotyledons			
Aceraceae			
	*	*Acer negundo*	Box Elder
Apiaceae			
		Actinotus helianthi	Flannel Flower
		Actinotus minor	Lesser Flannel Flower
		Platysace linearifolia	
Asclepiadaceae			
	*	*Araujia hortorum*	
Asteraceae			
	*	*Ageratina adenophora*	Crofton Weed
	*	*Sonchus oleraceus*	Common Sowthistle
	*	*Taraxacum officinale*	Dandelion
Cactaceae			
		Opuntia spp.	
Caprifoliaceae			
	*	*Lonicera japonica*	Japanese Honeysuckle
Casuarinaceae			
		Allocasuarina littoralis	Black Sheoak
Chenopodiaceae			
		Einadia hastata	Berry Saltbush
Convolvulaceae			
		Dichondra repens	Kidney Weed
Cunoniaceae			
		Ceratopetalum gummiferum	Christmas Bush
Epacridaceae			
		Epacris microphylla var. *microphylla*	Coast Coral Heath
		Leucopogon ericoides	Pink Beard-heath
		Leucopogon juniperinus	Long-flower Beard-heath
		Monotoca scoparia	Prickly Broom-heath
Fabaceae (Mimosoideae)			
		Acacia decurrens	Black Wattle
		Acacia linifolia	Flax-leaved Wattle
		Acacia longifolia	Coast/Sallow Wattle
		Acacia myrtifolia	Red-stemmed Wattle
		Acacia oxycedrus	Spike Wattle
		Acacia parramattensis	Parramatta Wattle
		Acacia suaveolens	Sweet Wattle
		Acacia terminalis	Sunshine Wattle
Fabaceae (Faboideae)			
		Bossiaea heterophylla	Variable Bossiaea
		Bossiaea obcordata	Spiny Bossiaea
		Dillwynia floribunda	
		Glycine clandestina	Twining Glycine
		Glycine tabacina	Variable Glycine
		Gompholobium grandiflorum	Large Wedge Pea

Family		Scientific name	Common name
		Hardenbergia violacea	False Sarsaparilla
		Hovea linearis	
		Mirbelia speciosa ssp. *speciosa*	
		Viminaria juncea	Native Broom
Geraniaceae			
		Geranium homeanum	Northern Cranesbill
Goodeniaceae			
		Dampiera purpurea	Mountain Dampiera
		Scaevola ramosissima	Hairy Fan-flower
Haloragaceae			
		Gonocarpus teucrioides	Germander Raspwort
Lauraceae			
		Cassytha glabella f. *glabella*	Slender Dodder-laurel
Lobeliaceae			
		Pratia purpurascens	Whiteroot
Loganiaceae			
		Mitrasacme polymorpha	Varied Mitrewort
Myrtaceae			
		Angophora bakeri	Narrow-leaved Apple
		Angophora floribunda	Rough-barked Apple
		Callistemon citrinus	Crimson Bottlebrush
		Calytrix tetragona	
		Corymbia gummifera	Red Bloodwood
		Darwinia grandiflora	
		Eucalyptus eugenioides	Thin-leaved Stringybark
		Eucalyptus piperita	Sydney Peppermint
		Eucalyptus punctata	Grey Gum
		Eucalyptus racemosa	Narrow-leaved Scribbly Gum
		Eucalyptus resinifera ssp. *resinifera*	Red Mahogany
		Eucalyptus sieberi	Silvertop Ash
		Kunzea ambigua	Tick Bush
		Leptospermum polygalifolium ssp. *polygalifolium*	Tantoon
		Leptospermum trinervium	Paperbark Tea-tree
		Melaleuca linariifolia	Budjur
		Melaleuca thymifolia	
Oleaceae			
	*	*Ligustrum sinense*	Small-leaved Privet
Oxalidaceae			
		Oxalis perennans	Grassland Wood-sorrel
		Oxalis spp.	
Pittosporaceae			
		Bursaria spinosa ssp. *spinosa*	Sweet Bursaria
Plantaginaceae			
	*	*Plantago lanceolata*	Lamb's Tongues
Proteaceae			
		Banksia ericifolia ssp. *ericifolia*	
		Banksia serrata	Saw Banksia
		Banksia spinulosa var. *spinulosa*	

Family		Scientific name	Common name
		Conospermum longifolium ssp. *angustifolium*	
		Conospermum taxifolium	Variable Smoke-bush
		Conospermum tenuifolium	
		Grevillea diffusa ssp. *diffusa*	
		Grevillea mucronulata	
		Grevillea sericea ssp. *sericea*	
		Grevillea sphacelata	
		Hakea dactyloides	Finger Hakea
		Hakea sericea	Bushy Needlewood
		Hakea teretifolia ssp. *teretifolia*	
		Isopogon anemonifolius	
		Isopogon anethifolius	
		Lambertia formosa	Mountain Devil
		Lomatia silaifolia	Crinkle Bush
		Persoonia levis	Broad-leaved Geebung
		Persoonia linearis	Narrow-leaved Geebung
		Persoonia pinifolia	Pine-leaved Geebung
		Petrophile sessilis	
		Telopea speciosissima	Waratah
Rhamnaceae			
		Alphitonia excelsa	Red Ash
Rosaceae			
	*	*Rubus fruiticosus*	Blackberry complex
Rubiaceae			
		Pomax umbellata	Pomax
Rutaceae			
		Correa reflexa var. *reflexa*	Native Fuschia
		Eriostemon australasius	
Santalaceae			
		Exocarpos cupressiformis	Native Cherry
		Exocarpos strictus	Dwarf Cherry
		Leptomeria acida	Sour Currant Bush
Sapindaceae			
		Dodonaea camfieldii	
		Dodonaea triquetra	Large-leaf Hop-bush
Thymelaeaceae			
		Pimelea linifolia ssp. *linifolia*	Slender Rice-flower

Note: * signifies exotic species

APPENDIX 2

Fauna Results

Terrestrial fauna recorded in study site

Scientific Name	Common Name	Type of Record
Amphibians		
Crinia signifera	Common Eastern Froglet	H
Birds		
Cacatua galerita	Sulphur-crested Cockatoo	O/H
Coracina novaehollandiae	Black-faced Cuckoo-shrike	O
Strepera graculina	Pied Currawong	O
Corvus coronoides	Australian Raven	O
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	O
Cormobates leucophaeus	White-throated Treecreeper	H
Rhipidura fuliginosa	Grey Fantail	O
Malurus cyaneus	Superb Fairy-wren	O
Acanthorhynchus tenuirostris	Eastern Spinebill	H
Anthochaera carunculata	Red Wattlebird	O/H
Anthochaera chrysoptera	Little Wattlebird	O/H
Phylidonyris novaehollandiae	New Holland Honeyeater	
Acanthiza pusilla	Brown Thornbill	
Lichenostomus chrysops	Yellow-faced Honeyeater	H
Lichmera indistincta	Brown Honeyeater	H
Manorina melanocephala	Noisy Miner	O/H
Meliphaga lewinii	Lewin's Honeyeater	H
Melithreptus lunatus	White-naped Honeyeater	O
Colluricincla harmonica	Grey Shrike-thrush	H
Pachycephala pectoralis	Golden Whistler	O
Acanthiza pusilla	Brown Thornbill	O
Pardalotus punctatus	Spotted Pardalote	H
Pardalotus striatus	Striated Pardalote	O
Eopsaltria australis	Eastern Yellow Robin	H
Alisterus scapularis	Australian King-Parrot	O/H
Platycercus elegans	Crimson Rosella	O
Zosterops lateralis	Silvereye	O
Mammals – Native		
Scotorepens orion or Scoteanax rueppellii or Falsistrellus tasmaniensis	Eastern Broad-nosed Bat or Greater Broad-nosed Bat or Eastern False Pipistrelle	A
Chalinolobus gouldii	Gould's wattle Bat	A

Vespadelus darlingtoni	Large Forest Bat	A
Vespadelus vulturnus	Little Forest Bat	A
Myotis macropus	Soutrhern Myotis*	A
Macropus giganteus	Eastern Grey Kangaroo	O
Vombatus ursinus	Common Wombat	I
Mammals - Introduced		
Vulpes vulpes	Fox	I
Oryctolagus cuniculus	Rabbit	I
Reptiles		
Tympanocryptis diemensis	Mountain Dragon	O
Eulamprus quoyii	Eastern Water Skink	O
Lampropholis guichenoti	Garden Skink	O

Key: O=observed, H-Heard, I= Indirect evidence (scats, tracks, marks….), A= Anabat detector. * listed as Vulnerable on the TSC Act

APPENDIX 3

Conservation Rating According to Briggs and Leigh (1995)

Conservation Rating According to Briggs and Leigh (1996)

Briggs and Leigh (1996) list over 5,031 species, subspecies and varieties of plants (5% of native vascular flora of Australia) that have been ranked according to their conservation status. While many of these species are contained within the schedules of various state and federal threatened species legislation (eg. TSC Act and *EPBC* Act), and are subject to legislative provisions under those acts, a great many more do not and as a such are extraneous to statutory assessment processes.

The modified list below presents the range of codes that are, in various combinations, applied to each listed plant species.

- **1** Species only known from one collection
- **2** Species with a geographic range of less than 100km in Australia
- **3** Species with a geographic range of more than 100km in Australia
- **X** Species presumed extinct; no new collections for at least 50 years
- **E** Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate
- **V** Vulnerable species at risk of long-term disappearance through continued depletion.
- **R** Rare, but not currently considered to be endangered.
- **K** Poorly known species that are suspected to be threatened.
- **C** Known to be represented within a conserved area.
- **a** At least 1,000 plants are known to occur within a conservation reserve(s).
- **i** Less than 1,000 plants are known to occur within a conservation reserve(s).
- **-** The reserved population size is unknown.
- **t** The total known population is reserved.
- + The species has a natural occurrence overseas.

APPENDIX 4

EPBC Significant Impact Guidelines

Significant Impact Guidelines

The EPBC Act Significant Impact Guidelines (DEH 2006) list Significant Impact Criteria for matters of national environmental significance that should be taken into consideration to determine whether a proposed development is likely to have a significance impact on threatened species, populations or ecological communities listed on the EPBC Act that are known to occur or potentially occur in the study area.

Under the EPBC Act, if the proposed development has the potential to have an adverse impact on a threatened species, population or ecological community listed on the Act, the proposal must be referred to the Federal Minister for the Environment for further consideration.

Endangered Ecological Communities

Shale Sandstone Transition Forest is listed as an Endangered Ecological Community (EEC) under the EPBC Act. The potential impacts of the proposal on this EEC are assessed against the Significant Impact Criteria of the EPBC Act below.

Shale Sandstone Transition Forest

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

• reduce the extent of an ecological community;

Shale Sandstone Transition Forest (High Sandstone Influence) was recorded in the study area.

Based on the vegetation mapping of the area (Figure 3), the proposal will result in direct impacts to approximately 0.06 ha of SSTF in the study area. DEC (NPWS 2002b) have mapped approximately 3,028 ha of SSTF (High Sandstone Influence) within the local area. In addition, a further 1,189 ha of variants of SSTF have been mapped as occurring in the local area. The area to be disturbed as part of the proposed development is a small fragmented patch, surrounded by disturbances such as Appin Road and Appin Colliery. The removal of 0.06 ha of SSTF is not likely to have an adverse effect on the extent of the ecological community.

• fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;

Shale Sandstone Transition Forest that will be disturbed as part of the proposal consists of a small fragmented patch of vegetation that is surrounded by disturbances such as Appin Road and Appin Colliery. The proposed development will temporarily increase the fragmentation of this patch, however the area will be regenerated once works have been completed. It is recommended that clearing of any trees is avoided to reduce impacts of fragmentation. Furthermore, given the current impacts from weed invasion, mitigation measures, such as the implementation of bush regeneration techniques, are likely to improve the condition of the SSTF in the study area in the long term.

Where possible, clearing will be restricted to areas that are already disturbed, such as track and powerline easements, and clearing of trees will be avoided. In the long term, the proposal is not likely to increase fragmentation of this EEC.

• **adversely affect habitat critical to the survival of an ecological community;**

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, no critical habitat for SSTF has been listed on the Register of Critical Habitat. A recovery plan has not yet been prepared under this EEC under the EPBC Act. Under the TSC Act, a recovery plan for SSTF is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain.

The SSTF in the study area is not likely to be critical habitat, given the condition, fragmentation and small size of the patch. The proposal is not likely to impact on habitat critical to the survival of this EEC.

• modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;

Based on the vegetation mapping of the area (Figure 3), the proposal will result in the clearing of approximately 0.06 ha of SSTF, with indirect impacts to a further 0.1 ha. This is likely to be an over estimate of the impacted area given that areas not considered to support this community in the field assessment are mapped as SSTF.

The proposal will not further modify or destroy abiotic factors necessary for the EECs survival, provided mitigation measures, such as erosion and sedimentation control and site rehabilitation, are implemented.

• cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;

The proposal would potentially increase the threat of weed invasion in the SSTF in the study area, however the SSTF in the study area is represented by a small fragmented stand that is already impacted by weed invasion due to surrounding land uses. Implementation of mitigation measures such as weed management, will reduce the threat of weed invasion on SSTF.

The site specific VMP should also detail methods of site rehabilitation, including regeneration and revegetation techniques and species to be used in any landscaping. This will reduce the threat of establishment of exotics and non-local native species in the SSTF in the study area and encourage local native species diversity.

• cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

– assisting invasive species, that are harmful to the listed ecological community, to become established; or

– causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or

SSTF in the study area is considered to be in moderate condition, with impacts from surrounding land uses resulting in weed invasion, vegetation clearance and rubbish dumping.

The proposal would potentially increase the threat of invasive species becoming established in the SSTF in the study area, however the SSTF in the study area is

represented by a small fragmented stand that is already impacted by weed invasion. Invasive species recorded in the SSTF in the study area, such as *Pennisetum clandesinum,* could potentially benefit from increased disturbance resulting from the proposal. Implementation of mitigation measures such as bush regeneration, will reduce the threat of weed invasion on SSTF and known invasive species should be a focus of any weed management programs.

The proposal will not involve the introduction of chemicals into the SSTF in the study area. Any chemicals used on site during the construction and operation phase of the proposal will be taken off site after use and disposed of appropriately. It is possible that herbicide will be used as part of the bush regeneration program to control certain weeds, however it will only be used by personnel experienced in the use of such chemicals.

The proposal is not likely to cause a substantial reduction in the quality or integrity of the occurrence SSTF in the study area, provided mitigation measures are implemented as appropriate.

• interfere with the recovery of an ecological community.

A recovery plan has not yet been prepared under this EEC under the EPBC Act. Under the TSC Act, a recovery plan for SSTF is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain. The proposal is not likely to interfere with the recovery of this EEC.

Conclusion

Based on the above assessment, SSTF is unlikely to be significantly impacted by the proposal and as such a referral under the provisions of the EPBC Act is not recommended for this EEC.

Endangered Species

Potential habitat occurs within the study site for one Endangered plant species listed on the EPBC Act*: Persoonia hirsuta.* The potential impacts of the proposed works on this species are assessed against the Significant Impact Criteria of the EPBC Act below.

This species was not recorded within the study site during the current survey.

Persoonia hirsuta

Potential habitat for *Persoonia hirsuta* occurs in Exposed Sandstone Scribbly Gum Woodland and Shale Sandstone Transition Forest in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.3 ha of these vegetation communities will be directly impacted by the proposed pipeline, with an additional 0.8 ha being indirectly impacted.

Is the action likely to lead to a long-term decrease in the size of a population of a species?

Persoonia hirsuta was not recorded in the study area. The study area is not likely to support a population of the species. The proposal is therefore unlikely to lead to a long-term decrease in the size of a population of the species.

Is the action likely to reduce the area of occupancy of the species?

Persoonia hirsuta was not recorded in the study area. The removal or modification of 0.3 ha of vegetation that is potential habitat for *Persoonia hirsuta* is not likely to reduce the area of occupancy of the species given that approximately 11,784 ha of similar potential habitat (SSTF and ESSW) is mapped as occurring in the local area.

Is the action likely to fragment an existing population into two or more populations?

No populations of *Persoonia hirsuta* were recorded in the study area. Potential habitat for *Persoonia hirsuta* that will be disturbed as part of the proposed works is part of a larger expanse of native vegetation that is generally in Good condition. The area of proposed disturbance is situated in the proximity of other previous disturbances such as Appin Road and Appin Colliery and an existing powerline easement. The majority of the direct impacts will be restricted to existing disturbed areas such as tracks and powerline easements. Where clearing is required through native bushland, disturbed areas will be regenerated post works to reduce the impacts of fragmentation.

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);

- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, no critical habitat for *Persoonia hirsuta* has been listed on the Register of Critical Habitat. A recovery plan for this species is in preparation, but not yet available to the public.

The potential habitat for *Persoonia hirsuta* in the study area is not likely to be critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for breeding, dispersal, long-term maintenance, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of a population?

Persoonia hirsuta was not recorded in the study area. The proposed removal or modification of a total of 0.3 ha of vegetation that is potential habitat for *Persoonia hirsuta*, with potential indirect impacts to a further 0.8 ha of potential habitat is unlikely to disrupt the breeding cycle of a population.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Persoonia hirsuta was not recorded in the study area. Potential habitat for *Persoonia hirsuta* in the study area occurs in Exposed Sandstone Scribbly Gum Woodland and SSTF. The proposal will remove or modify a maximum of 0.3 ha of vegetation that is potential habitat for *Persoonia hirsuta.*

Potential habitat for *Persoonia hirsuta* occurs in Exposed Sandstone Scribbly Gum Woodland and Shale Sandstone Transition Forest in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.3 ha of these vegetation communities will be directly impacted by the proposed pipeline, with an additional 0.8 ha being indirectly impacted. This is a relatively small proportion (less than 0.01%) of similar habitats in the local area, with 8,756 ha of ESSW and 3,028 ha of SSTF mapped as occurring in the local area.

The area of potential habitat to be impacted by the proposed works is part of a larger expanse of vegetation. The proposed works will be located adjoining an

existing road and powerline easement, therefore no area of potential habitat will become isolated. Furthermore, fragmented areas will be regenerated post works, with the pipeline being installed underground over most of its length.

The proposed works is not likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?

The proposal will result in the removal of approximately 0.3 ha of vegetation that is potential habitat for *Persoonia hirsuta*, with potential indirect impacts to a further 0.8 ha of potential habitat. Given the presence of exotic grasses along parts of the existing road, it is possible that the proposal will result in the spread of invasive species. As a precaution, vehicles should be cleaned prior to earthworks undertaken on the site to ensure weed seed is not spread into bushland areas and bush regeneration works will need to be implemented if exotic species become established.

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 0.3 ha of potential habitat for *Personia hirsuta* is not likely to introduce disease that may cause the species to decline. However as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere with the recovery of the species?

The recovery plan for *Persoonia hirsuta* is currently being prepared and is not yet available to the public. The proposed works are not likely to interfere with the recovery of *Persoonia hirsuta* given that the species was not recorded in the study area and only a relatively small area of potential habitat will be impacted.

Conclusion

Based on the above assessment, *Persoonia hirsuta* is unlikely to be significantly impacted by the proposed works and as such a referral under the provisions of the EPBC Act is not recommended for this species.

Vulnerable Species

Potential habitat occurs within the study area for three Vulnerable plant species listed on the EPBC Act*: Acacia bynoeana, Grevillea parviflora* spp. *parviflora* and *Pultenaea aristata*. The potential impacts of the proposed works on these

species are assessed against the Significant Impact Criteria of the EPBC Act below.

Acacia bynoeana

Potential habitat for *Acacia bynoeana* exists in Exposed Sandstone Scribbly Gum Woodland (ESSW) within the powerline easement and track margins along the ridgetop in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.2 ha of this vegetation community will be directly impacted by the proposed works, with a further 0.7 ha indirectly impacted.

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

An 'important population' is defined by DEH (2006) as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

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

Acacia bynoeana was not recorded in the study area. The study area is therefore unlikely to support an important population of this species.

Is the action likely to reduce the area of occupancy of an important population?

Acacia bynoeana was not recorded in the study area. The study area is therefore unlikely to support an important population of this species.

Is the action likely to fragment an existing important population into two or more populations?

Acacia bynoeana was not recorded in the study area. The study area is not considered to contain an important population of *Acacia bynoeana.*

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;

- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, the Register of Critical Habitat does not contain any listing for *Acacia bynoeana* and a recovery plan for the species has not been prepared.

The potential habitat for *Acacia bynoeana* in the study area is not likely to be critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for breeding, dispersal, long-term maintenance, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of an important population?

The study area is not considered to contain an important population of *Acacia bynoeana.* The proposed is therefore not likely to disrupt the breeding cycle of am important population of the species.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Acacia bynoeana was not recorded in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.2 ha of this vegetation community will be directly impacted by the proposed works, with a further 0.7 ha indirectly impacted.

Approximately 8,756 ha of ESSW is mapped as occurring in the local area. Therefore, the impacted area equates to 0.01% of similar potential habitat for the species in the local area.

Furthermore, the area of potential habitat to be impacted by the proposed development is part of a larger expanse of native vegetation, with the impact area within close proximity to existing disturbances such as roads, tracks and powerline easements. No area of potential habitat will become isolated.

Therefore, the proposed works are unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal will result in the modification or removal of approximately 0.9 ha of vegetation that is potential habitat for *Acacia bynoeana.* Given the presence of exotic grasses along the existing road and track, it is possible that the proposed works may result in the establishment of invasive species. Therefore, as a precaution, vehicles should be cleaned prior to earthworks undertaken on the site to ensure weed seed is not spread into bushland areas. Furthermore, if exotic species become established in the area, bush regeneration works will need to be carried out.

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 0.9 ha of potential habitat for *Acacia bynoeana* is not likely to introduce disease that may cause the species to decline. However as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere substantially with the recovery of the species?

To date, no recovery plan has been written for *Acacia bynoeana.* The proposal is not likely to interfere with the recovery of the species given that the species was not recorded in the study area and the proposal will only impact on a relatively small proportion (0.01%) of potential habitat for the species in the local area.

Conclusion

Based on the above assessment, *Acacia bynoeana* is unlikely to be significantly impacted by the activities and as such a referral under the provisions of the EPBC Act is not recommended for these species.

Grevillea parviflora* ssp. *parviflora

Potential habitat for *Grevillea parviflora* spp. *parviflora* exists in SSTF and ESSW in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.3 ha of these vegetation communities will be directly impacted by the proposed development, with a further 0.8 ha indirectly impacted.

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

An 'important population' is defined by DEH (2006) as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

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

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. The study area is therefore unlikely to support an important population of this species.

Is the action likely to reduce the area of occupancy of an important population?

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. The study area is therefore unlikely to support an important population of this species.

Is the action likely to fragment an existing important population into two or more populations?

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. The study area is therefore not considered to contain an important population of *Grevillea parviflora* spp. *parviflora.*

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or

ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, the Register of Critical Habitat does not contain any listing for *Grevillea parviflora* ssp. *parviflora* and a recovery plan for the species has not been prepared.

The potential habitat for *Grevillea parviflora* ssp. *parviflora* in the study area is not likely to be critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for breeding, dispersal, long-term maintenance, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of an important population?

The study area is not considered to contain an important population of *Grevillea parviflora* ssp. *parviflora*. The proposed is therefore not likely to disrupt the breeding cycle of an important population of the species.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Potential habitat for *Grevillea parviflora* spp. *parviflora* exists in SSTF and ESSW in the study area. Based on the vegetation mapping of the area (Figure 3), approximately 0.3 ha of SSTF will be directly impacted by the proposed development, with a further 0.8 ha indirectly impacted. This is a relatively small portion (less than 0.01%) of similar potential habitat in the local area, with 3,028 ha of SSTF and 8,756 ha of ESSW mapped as occurring within a 10 km radius of the study area.

The impacted area is a small fragmented patch within close proximity to existing disturbances such as Appin Road and Appin Colliery. No area of potential habitat will become isolated, with mitigation measures such as site rehabilitation and avoidance of any trees reducing the impacts of fragmentation.

Therefore, the proposed works are unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal will result in the modification or removal of approximately 1.1ha of vegetation that is potential habitat for *Grevillea parviflora* ssp. *parviflora.* Given the presence of exotic grasses along the existing road and Appin Colliery land, it

is possible that the proposed works may result in further establishment of invasive species. Therefore, as a precaution, vehicles should be cleaned prior to earthworks undertaken on the site to ensure weed seed is not spread into bushland areas. Furthermore, if exotic species become established in the area, bush regeneration works will need to be carried out.

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 1.1ha of potential habitat for *Grevillea parviflora* spp. *parviflora* is not likely to introduce disease that may cause the species to decline. However as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere substantially with the recovery of the species?

To date, no recovery plan has been written for *Grevillea parviflora* ssp. *parviflora.*

Conclusion

Based on the above assessment, *Grevillea parviflora* ssp. *parviflora* is unlikely to be significantly impacted by the activities and as such a referral under the provisions of the EPBC Act is not recommended for these species.

Pultenaea aristata

Potential habitat for *Pultenaea aristata* occurs in the study area in Western Sandstone Gully Forest along the Georges River and ESSW. Based on the vegetation mapping of the area (Figure 3), approximately 0.4 ha of these vegetation communities will be directly impacted by the proposed development, with a further 1.1 ha being indirectly impacted. This is likely to be an overestimate, given that the majority of the direct impacts will be restricted to existing cleared tracks within the area mapped as WSGF.

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

An 'important population' is defined by DEH (2006) as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

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

Pultenaea aristata was not recorded in the study area. The study area is therefore unlikely to support an important population of this species.

Is the action likely to reduce the area of occupancy of an important population?

Pultenaea aristata was not recorded in the study area. The study area is therefore unlikely to support an important population of this species.

Is the action likely to fragment an existing important population into two or more populations?

Pultenaea aristata was not recorded in the study area. The study area is therefore not considered to contain an important population of *Pultenaea aristata.*

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, the Register of Critical Habitat does not contain any listing for *Pultenaea aristata* and a recovery plan for the species has not been prepared.

The potential habitat for *Pultenaea aristata* in the study area is not considered to be critical habitat, as the species was not recorded in the study area and is not likely to be necessary for breeding, dispersal, long-term maintenance, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of an important population?

The study area is not considered to contain an important population of *Pultenaea aristata.* The proposed is therefore not likely to disrupt the breeding cycle of am important population of the species.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Pultenaea aristata was not recorded in the study area. Potential habitat for *Pultenaea aristata* in the study area occurs in WSGF and ESSW. The proposal will remove or modify approximately 0.4 ha of vegetation that is potential habitat for *Pultenaea aristata,* with a further 1.1 ha being indirectly impacted.

At least 8,756 ha of Exposed Sandstone Scribbly Gum Woodland has been mapped in the locality (within 10 km of the study area) by DEC (NPWS 2003a). In addition, approximately 1,581 ha of WSGF has been mapped as occurring in the local area. The area of habitat to be removed as part of the proposal equates to 0.01% of similar vegetation that exists in the locality.

Furthermore, the area of potential habitat to be impacted by the proposed development is part of a larger expanse of native vegetation, with the impact area within close proximity to existing disturbances such as Appin Road, tracks, Appin Colliery and a powerline easement. No area of potential habitat will become isolated.

Therefore, the proposed works are unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal will result in the modification or removal of approximately 1.5 ha of vegetation that is potential habitat for *Pultenaea aristata.* Given the presence of exotic grasses along the existing access road, it is possible that the proposed works may result in the establishment of invasive species. Therefore, as a precaution, vehicles should be cleaned prior to earthworks undertaken on the site to ensure weed seed is not spread into bushland areas. Furthermore, if exotic species become established in the area, bush regeneration works will need to be carried out.

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 1.5 ha of potential habitat for *Pultenaea aristata* is not likely to introduce disease that may cause the species to decline. However as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere substantially with the recovery of the species?

To date, no recovery plan has been written for *Pultenaea aristata.* The proposal is not likely to interfere with the recovery of *Pultenaea aristata* as the species was not recorded in the study area and the proposal will impact on a relatively small portion of similar potential habitats in the local area.

Conclusion

Based on the above assessment, *Pultenaea aristata* is unlikely to be significantly impacted by the activities and as such a referral under the provisions of the EPBC Act is not recommended for these species.

APPENDIX 5

Anabat Report

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Data Report for Anabat Analysis

Date: **13th February 2007**

Client: **Biosis**

Job Name: **Appin Road 4640**

Survey Dates: 16/1/07

Note on Identification Confidence:
Some insectivorous bats have echolocation calls that are unlikely to be confused with those of other species. Other bats overlap in call frequency and structure, making identification difficult. Quality of the recording varies, and in some cases calls are not identifiable. In some cases a single anabat call may be classified as more than one species because two calls may have been recorded together or where there is the possibility of a call being one of two or more species. For this analysis echolocation call identifications have been assigned to three categories:

C Confident: Small possibility of confusion of calls with those of other bat species.

P Probable: Some possibility of confusion of calls with those of other bat species.

Po Possible: Likely to be confused with calls with those of other bat species.

Notes on Anabat Identification Standards:
The following information has been provided in accordance with the Australasian Bat Society's (Reardon 2003) recommendations of what should be included in consultant reports using anabat-based bat surveys:

- Sample sonograms from this survey have been supplied
- A table describing call characteristics used for identification has been included
- A run is defined as any identified call that is separated by 20 seconds from a call of the same species.
- A call is defined as any series of anabat pulses longer than a few pulses, and is on reasonable quality
- The call library of Mick Welsh has been used, along with that included in Pennay (2004) and Reinhold *et al* (2001).

Bat Species Detected by Anabat and Call Characteristics used to identify species

Species	Level of ID confidence	Characteristic frequency (kHz)	Other identifying call features	Notes
Scotorepens orion or *Scoteanax rueppellii* or *Falsistrellus tasmaniensis*	Po	35		One call only from this bat. Poor quality, short call. The call could be either of these 3 species
Chalinolobus gouldii	C	around 30	alternating frequency	
Vespadelus darlingtoni	C	41-43		
Vespadelus vulturnus	C	low 50's	Up-sweeping tail	
Myotis macropus	Po	Vertical	Pulse interval <7.5MS	Poor quality short call

Results from anabat session

Date: 16/1/07 **Time Start:** **Time End**:
Location Description:
AMG Zone: **Easting:** **Northing:**

Species	# Runs for species	Time of !st Call	Notes
Scotorepens orion or *Scoteanax rueppellii* or *Falsistrellus tasmaniensis*	1	20:30	
Chalinolobus gouldii	13	20:33	
Vespadelus darlingtoni	6	20:43	
Vespadelus vulturnus	6	20:46	
Myotis macropus	1	20:58	

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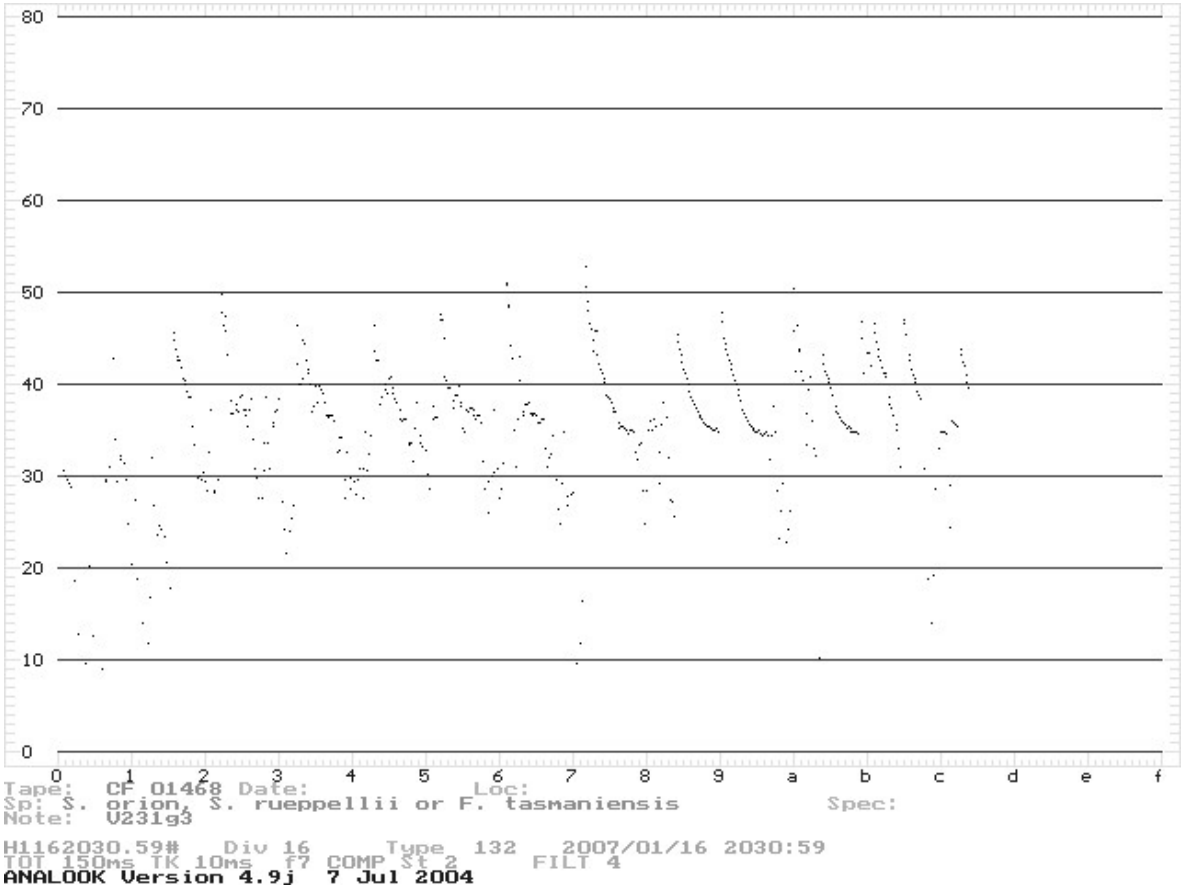
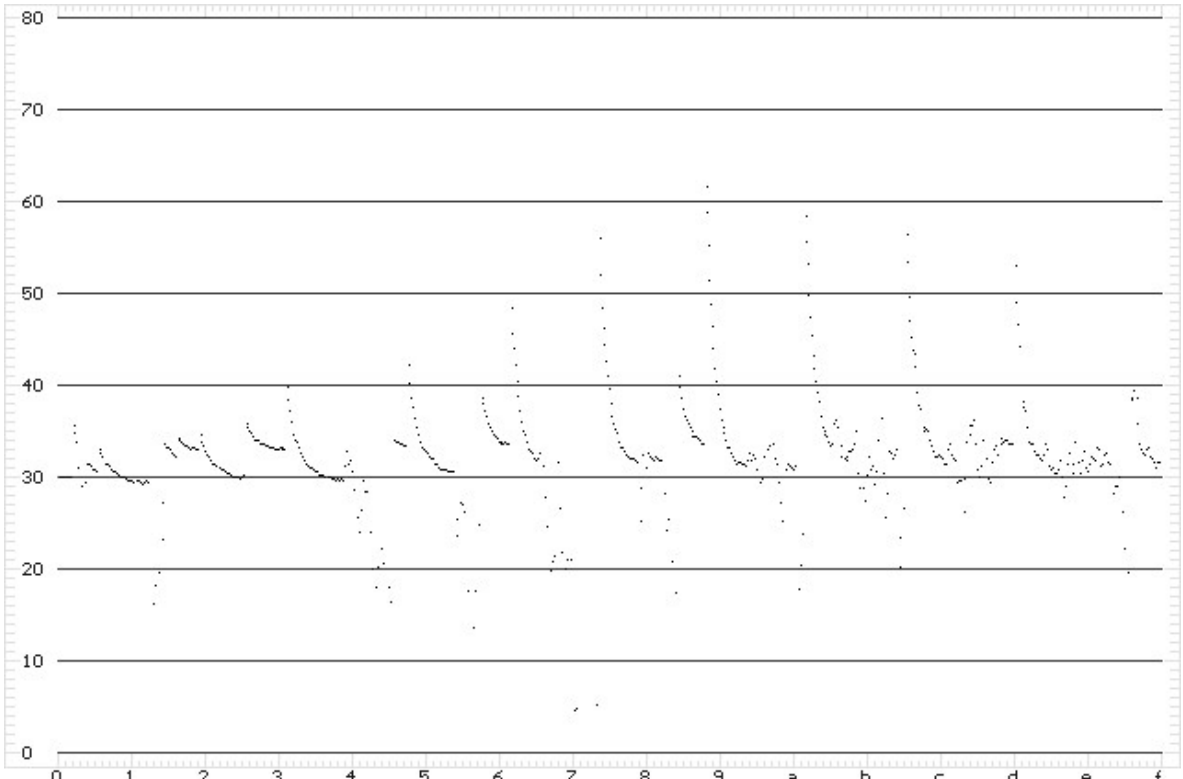
Anabat Sonograms
Representative bat call sonograms from this survey





Tape: CF 01468 Date: Loc:
Sp: Chalinolobus gouldii Spec:
Note: V231g3

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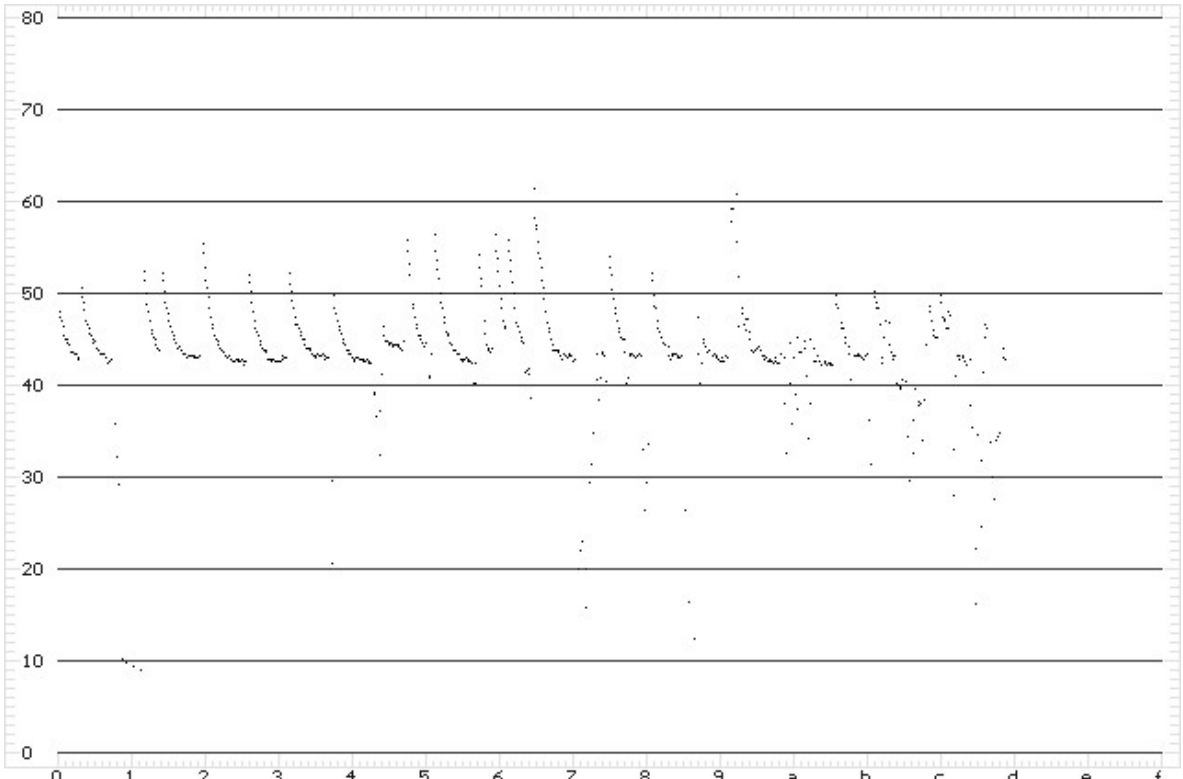
ANALOOK Version 4.9j 7 Jul 2004



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Sp: Vespadelus darlingtoni Spec:
Note: V231g3

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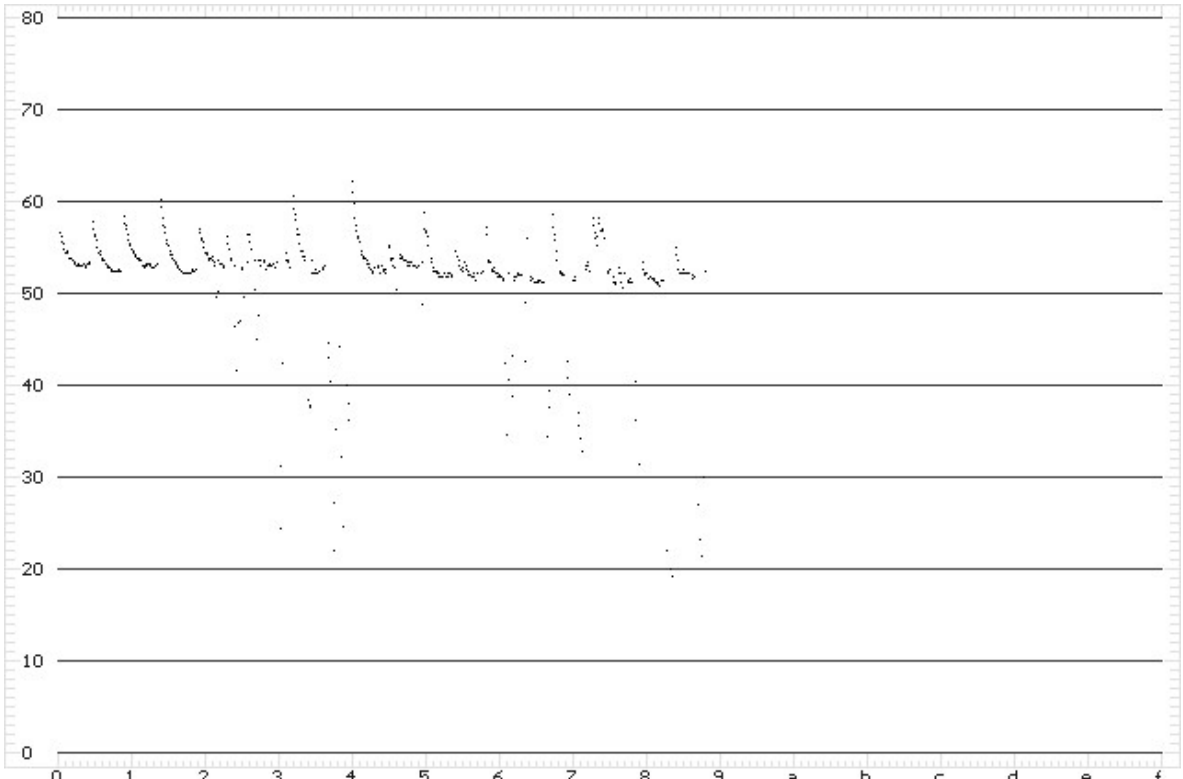

Tape: CF 01468 Date: Loc:
Sp: Vespadelus vulturnus Spec:
Note: V231g3

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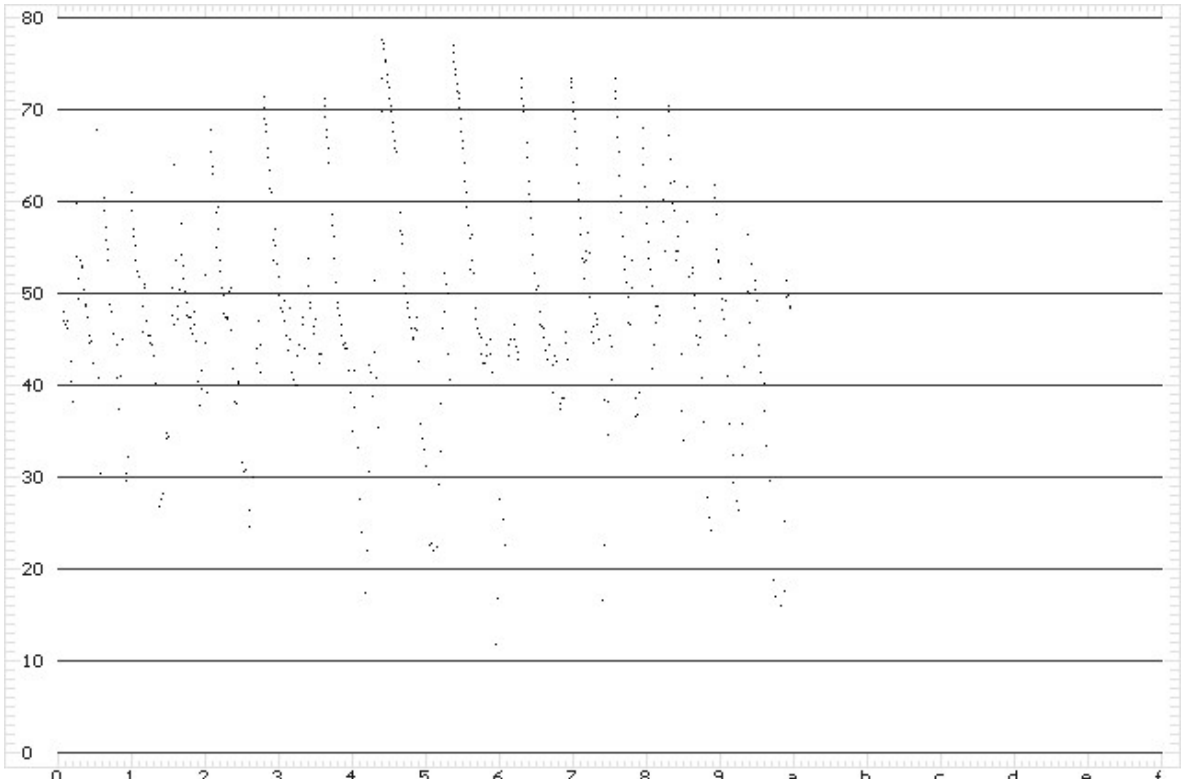
ANALOOK Version 4.9j 7 Jul 2004



Tape: CF 01468 Date: Loc:
Sp: Possible Myotis macropus Spec:
Note: V231g3

H1162058.14# Div 16 Type 132 2007/01/16 2058:14
TOT 150ms TK 10ms f7 COMP St 2 FILT 4
ANALOOK Version 4.9j 7 Jul 2004

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