- Derived native grassland

It is unlikely that removal of this small amount of habitat would have a significant impact upon the species, however it contributes to the cumulative removal of known habitat for the BCEP proposed Modification.

6. Prasophyllum sp Wybong

Status

Prasophyllum sp. Wyobong (C. Phelps ORG 5269) is listed as a Critically Endangered species under the EPBC Act.

Distribution, habitat and ecology

Prasophyllum sp. Wybong is a terrestrial orchid species that grows to approximately 30cm high. The species has a dull green basal leaf that is tubular and fleshy. The single flower spike has numerous fragrant flowers.

The species is endemic to NSW and is known to occur near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals.

The orchid is perennial appearing as a single leaf over winter and spring. The species flowers in spring and dies back to a tuber over the summer and autumn. The known habitat of the species is open eucalypt woodland and grassland (Office of Environment and Heritage 2014a).

Threats

Threats for this species include habitat clearing including mining, weed invasion (especially exotic grasses), vehicle traffic, roadside maintenance, inappropriate disturbance regimes, chemical drift from agriculture, illegal collection and chance extinction of small populations due to the few number of individuals in most populations (Office of Environment and Heritage 2014a).

Specific impacts

No *Prasophyllum sp. Wybong* was during the field survey, however habitat for the species within the proposed Modification area was identified in the following vegetation communities:

- Weeping myall Woodland.
- River Red Gum riparian woodlands and forests.
- Plains Grassland.
- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Derived native grassland

A total of 18.9 ha of potential habitat will be removed as a result of the proposed Modification.

6.1 EPBC Act significance assessment

Prasophyllum sp. Wybong is listed as a Critically Endangered species under the EPBC Act. The following assessment has been undertaken following the Principal Significant Impact Guidelines 1.1 (Department of Environment 2013).

Will the action lead to a long-term decrease in the size of a population?

No *Prasophyllum sp Wybong* was recorded within the proposed Modification area. However, if present the proposed Modification would lead to a decrease in the size of a local population. Given the higher quality habitat within the broader the locality the removal habitat is considered unlikely to lead to a long term decrease.

Will the action reduce the area of occupancy of the species?

If present the proposed Modification would reduce the area of occupancy for a local population of *Prasophyllum sp. Wybong*.

Will the action fragment an existing important population into two or more populations?

No *Prasophyllum sp Wybong* was recorded within the proposed Modification area. Therefore, the proposed Modification is not likely to fragment an existing important population into two or more populations.

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

No critical habitat has been listed for the *Prasophyllum sp. Wybong* under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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 (Department of Environment, 2013)

The habitat that would be affected as a result of the proposed Modification does not represent habitat critical to the survival of *Prasophyllum sp. Wybong*.

Will the action disrupt the breeding cycle of a population?

If present, the population of *Prasophyllum sp. Wybong* within the boundaries of the proposed Modification the fertilisation and dispersal mechanisms are unlikely to be affected by the proposed Modification therefore the breeding cycle is unlikely to be disrupted.

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

The proposed Modification will reduce the availability of habitat by 18.9 ha. Given the condition of habitat present, availability of higher quality habitat in the broader locality and the extent likely to be impacted (18.9 ha) the proposed Modification is not considered likely to cause the species to decline.

Will the action result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species´ habitat?

The proposed Modification area is already subject to high weed invasion as a result of agricultural activities. Doe to the high number of weeds existing in the study area and if the appropriate weed management actions were implemented the establishment of additional weeds would mean it would be unlikely that a significant invasive species would be introduced by the proposed Modification.

Will the action introduce disease that may cause the species to decline?

No, there are no known diseases associated with *Prasophyllum sp. Wybong*.

Will the action interfere substantially with the recovery of the species?

No *Prasophyllum* sp. *Wybong* were recorded within the proposed Modification area, however suitable habitat for the species does occur. The condition of habitat present is highly degraded as a result of agricultural activities. Due to the condition of habitat to be affected, greater quality habitat within the broader locality the removal of 18.9 ha of habitat is unlikely to substantially interfere with the recovery of the species.

Conclusion

Based on the above assessment, the reduction of potential *Prasophyllum sp. Wybong* habitat by 18.9 ha is unlikely to significantly impact upon the species.

7. *Tylophora linearis*

Status

Tylophora linearis is listed as Endangered under the EPBC Act and Vulnerable under the TSC Act.

Description

The species is an herbaceous climber in the Apocynaceae family. This species has cylindrical stems which have clear latex. The leaves are dark green in colour, linear in shape and grow to approximately 100 mm in length and 4 mm in width. Flowers are purplish internally with olive green petals, these flowers cluster in radiating groups of 3 to 8 (Office of Environment and Heritage 2013). Fruits form follicles 95-100 mm in length and 5 mm in width. This species flowers in Spring with flowers being recorded in early winter around May and as late as November. Fruiting occurs approximately two to three months later (Department of Environment Water Heritage and the Arts 2008b).

Distribution, habitat and ecology

Tylophora linearis populations occurs in ten known populations from Southern Queensland into Central NSW and as far south as Temora. This species is known to occur in several state forests including Goonoo, Pillaga West, Pillaga East, Bibblewindi, Cumbil, Hiawatha and Eura State Forests. This species has also been recorded in Coolbaggie Nature Reserve, Goobang National Park and Beni State Conservation Area. Old records for the species are as far north as Crow Mountain near Barraba and near Glenmorgan in the western Darling Downs (Office of Environment and Heritage 2013).

This species has been recorded associated with dry scrub, open forest and woodlands. Most frequency recorded associated with over storey trees such as *Melaleuca uncinata, Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla, Allocasuarina luehmannii, Acacia hakeoides, Acacia lineata* and *Myoporum* sp. This species has been recorded in EPBC Act listed communities of Brigalow (*Acacia harpophylla* dominant and co-dominant) and White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (Department of Environment Water Heritage and the Arts 2008b). The population within the vicinity of the proposed Modification area at Piliga West State Forest occurred within woodland dominated *by Eucalyptus pilligaensis* and *Callitris glaucophylla* with an understorey of *Acacia hakeoides* (NSW Scientific Committee 2008).

Threats

The main identified threats include forestry activities, and fire. Track maintenance and inappropriate disturbance regimes and Invasion of habitat from introduced weeds such as Lantana (*Lantana camara*) have also been identified as a threat to *Tylophora linearis* (Department of Environment Water Heritage and the Arts 2008b).

Specific impacts

No *Tylophora linearis* have been recorded within the Modification study area however it has been previously recorded within the Project Approval 09_0182.

Potential habitat has been recorded within the proposed Modification area in the following vegetation communities:

- Weeping myall Woodland.
- River Red Gum riparian woodlands and forests.
- Plains Grassland.

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Derived native grassland

A total of 18.9 ha of potential habitat will be removed as a result of the proposed Modification.

7.1 TSC Act significance assessment

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

The lifecycle of *Tylophora linearis* within the proposed Modification area is unlikely to be affected by the proposed Modification. While the pollination mechanisms of *Tylophora linearis* have not been identified, like other species of the *Tylophora* genus, it is likely to be insect pollinated. The woodland and grassland communities within the Modification provide habitat for the pollinators of *Tylophora linearis*. The species has plumed seeds which are dispersed by wind (Benson & McDougall 1993). The proposed Modification is unlikely to affect wind conditions in the area, and removal of 18.9 ha of potential habitat for *Tylophora linearis* is unlikely to have a significant impact upon the lifecycle processes.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the specie s that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

The proposed Modification will remove 18.9 ha of potential habitat for this species. This is in addition to the vegetation being removed by the BCEP. As a large area of potential habitat remains in the locality and a relatively large population remains within the locality, this is not considered a significant proportion of the habitat available within the region.

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

Connectivity within a plant population relates to the ability of individuals to disperse and cross pollinate. As previously mentioned the proposed Modification is unlikely to affect the mechanisms by which this species cross-pollinates or disperses.

The removal of 18.9 ha of potential habitat within the proposed modification area is unlikely to further fragment the population significantly.

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

Due to the small number of individuals to be removed and the size and relatively degraded nature of the habitat to be removed, it is not considered to be important to the long-term survival to either of the species in the locality.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species. The habitat within the boundaries of the proposed Modification is not considered to be critical to the survival of this species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Neither a recovery nor threat abatement plan has been prepared for *Tylophora linearis*, However, 12 state wide conservation actions for the recovery of this species have been identified by Office of Environment and Heritage (Office of Environment and Heritage 2013). The proposed Modification will not interfere with any of the identified recovery actions.

State Wide Conservation Actions for *Tylophora linearis*:

- Protect all known sites immediately from any type of disturbance (fire, grazing, forestry operations,etc) until such time as its conservation status is fully known and recovery actions are better developed.
- Determine the full extent, distribution and viability of surviving populations and identify at least 6 populations across the species range for implementation of recovery actions.
- Following targeted surveys, reassess the conservation status and if required, prepare and submit a nomination for listing as "Critically Endangered".
- Establish a comprehensive monitoring program for the 6 identified populations to determine the success or otherwise of recovery actions and to guide future actions.
- Conduct research to determine ecological requirements and undertake field studies to monitor seedling establishment and survivorship.
- Understand the species response to disturbance regimes by conducting experimental research into the effects of fire and grazing disturbance, in order to guide recovery actions.
- Investigate seed viability, germination, dormancy and longevity (in natural environment and in storage).
- Collect seed for NSW Seedbank. Develop collection program in collaboration with BGT - multiple provenances.
- Provide relevant landcare & community groups with information, support and guidance to assist in identifying the species and selecting appropriate sites for tree planting and other bush regen activities that will not impact on the species.
- Liaise with local indigenous groups to ascertain the importance or relevance of this species to indigenous cultures and seek their assistance in understanding the ecology of the species and in developing recovery actions.
- Ensure that local govt, DNR, Forestry and other planning agencies are kept informed of all known populations in order to assist them in making informed planning decisions regarding clearing, forestry and other development activities.

- Implement sympathetic habitat management on-park and ensure consideration of the species ecology and habitat in all forms of management planning. .

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The proposed Modification will directly involve one Key Threatening Process for this species: clearing of native vegetation. Invasion of habitat by exotic perennial grasses may also occur unless weed control measures are implemented during construction.

Conclusion

No *Tylophora linearis* was recorded within the proposed Modification study area however the species has previously been recorded within the previously approved project boundary. The proposal will remove approximately 18.9 ha of potential habitat identified within the modification area. Habitat for this species occurs in the following vegetation communities:

- Weeping myall Woodland.
- River Red Gum riparian woodlands and forests.
- Plains Grassland.
- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Derived native grassland

The proposed Modification is unlikely to have an adverse effect on the lifecycle of a viable local population so that *Tylophora linearis* is placed at risk of extinction. The proposed Modification is unlikely to affect pollination or seed dispersal mechanisms, because the areas to be removed are largely on the edge of larger stands of bushland and as such the edge effect and barrier effects will not be significantly altered from current regimes. The importance of the habitat to be removed by the proposed Modification, in terms of the long-term survival of *Tylophora linearis* in the locality, is likely to be low. Consequently, a significant impact to *Tylophora linearis* is considered unlikely to occur as a result of the proposed Modification.

7.2 EPBC Act significance assessment

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will result in one or more of the following.

Will the action lead to a long-term decrease in the size of a population?

No *Tylophora linearis* were recorded within the Modification study area however the species has been previously observed within the previously approved project boundary. The proposed modification will not result in the removal of any known individuals. Over the long-term it is unlikely to lead to the extinction of this species as a result of the proposed Modification because of the minimal disturbance (18.9 ha) and the extent of similar or greater quality habitat in the surrounding landscape.

Will the action reduce the area of occupancy the species?

Approximately 18.9 ha of potential habitat with the proposed modification area for *Tylophora linearis* would be affected by the proposed Modification. As the vegetation to be cleared (within the proposed modification area) are relatively small in terms of the extent of similar or greater quality habitat available in the surrounding landscape, the proposed Modification will not significantly reduce the area of occupancy for the species.

Will the action fragment an existing population into two or more populations?

No *Tylophora linearis* individuals were identified within the proposed modification area. The proposed Modification would not fragment an existing population into two or more populations. Existing potential habitat is fragmented as a consequence of existing land use practices, therefore the proposed Modification is not expected to increase fragmentation or isolation.

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

No critical habitat has been listed for the species under the EPBC Act. Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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.

Potential habitat within the proposed modification area are likely to be affected as a result of the proposed Modification is unlikely to be important for the long-term survival of *Tylophora linearis*, important for genetic diversity, or important for re-introductions as this patch of habitat is small and generally low condition.

Will the action disrupt the breeding cycle of a population?

Pollination vectors are unknown for this species, but other species of *Tylophora* are known to be pollinated by insects (Benson & McDougall 1993). *Tylophora linearis* produces plumed seeds and most likely relies on wind for seed dispersal. As these processes is unlikely to be significantly affected by the proposed Modification it is conceded that the breeding cycle for *Tylophora linearis* population are unlikely to be significantly affected.

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

The proposed Modification will impact 18.9 ha of habitat within the proposed modification area via the direct removal of suitable habitat. However, this does not constitute a significant proportion of the habitat available within the region, and as such is unlikely to result in a decline in the species.

Will the action 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 area of potential habitat which surrounds the proposed Modification is already disturbed from past land use practices and exotic species invasion; weeds occur commonly throughout all vegetative communities in the proposed Modification area. The proposed Modification is unlikely to significantly increase the spread of existing invasive species or contribute to the introduction of new species that are harmful to *Tylophora linearis*. If appropriate weed control management plans are implemented, impacts to potential habitat or any populations that are potentially present can be minimised.

Will the action introduce disease that may cause the species to decline?

There are no diseases known to affect this species and the proposed Modification is unlikely to introduce plant pathogens to the area.

Will the action interfere with the recovery of the species?

A recovery plan has not been prepared for the species, however, management actions as part of the saving our species program have been identified by Office of Environment and Heritage (2013). The proposed Modification will not interfere significantly with any of the identified management actions.

Conclusion

The proposed Modification will require the removal of 18.9 ha of potential habitat identified in the following vegetation communities present within the proposed Modification area:

- Weeping myall Woodland.
- River Red Gum riparian woodlands and forests.
- Plains Grassland.
- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Derived native grassland

Based on the relatively small area of habitat to be removed within the proposed modification area, is unlikely to be significantly affected by the proposed Modification. Overall, the potential impact from the proposed Modification on the species is not considered significant.

8. Threatened woodland birds

Threatened woodland birds have been assessed together as they generally share similar habitat requirements, threats that affect their recovery and potential impacts. Woodland species of bird considered in this significance assessment include:

- Brown Treecreeper (*Climacteris picumnus victoriae*).
- Hooded Robin (*Melanodryas cucullata cucullata*).
- Black-chinned Honeyeater (*Melithreptus gularis gularis*).
- Painted Honeyeater (*Grantiella picta*).
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*).
- Speckled Warbler (*Pyrrholaemus sagittatus*).
- Diamond Firetail (*Stagonopleura guttata*).
- Varied Sittella (*Daphoenositta chrysoptera*).

Status

All eight species are part of a group of woodland birds considered to be declining within Australia (Reid 1999; Trail & Duncan 2000) and all are listed as Vulnerable under the TSC Act.

Threats

Threats that affect these species include clearing of woodland resulting in loss and fragmentation of habitat; Modification and destruction of ground habitat through heavy grazing and compaction by stock; removal of litter and fallen timber; introduction of exotic pasture grasses; and frequent fire (Department of Environment and Conservation 2006b; Reid 1999; Trail & Duncan 2000).

Specific impacts

One threatened bird species was recorded during the site inspections (Grey-crowned Babbler). The proposed Modification will remove approximately 7.5 ha of potential habitat. This is made up of all the Woodland habitats in the proposed Modification area, including:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- River Red Gum riparian woodlands and forests (Moderate Condition).
- Weeping Myall Woodland.

Brown Treecreeper (eastern subspecies) – *Climacteris picumnus victoriae*

Brown Treecreepers occur in eucalypt woodland and adjoining vegetation. Sometimes this species is recorded in semi-cleared pasture; in grasslands scattered with trees in cleared paddocks outside woodlands or in shelterbelts fringing cleared lands (Higgins & Peter 2002). It is sedentary and nests in tree hollows (Garnett & Crowley 2000) breeding in pairs or communally in small groups within territories ranging in size up to 11 ha. The nest is a collection of grasses, feathers and other soft material, placed in a suitable tree hollow or similar site (Higgins *et al.* 2001). Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae (Pizzey & Knight 2007).

Hooded Robin - south-eastern form (*Melanodryas cucullata cucullate*)

Hooded Robins occur in lightly wooded country, usually open eucalypt woodland, mallee and acacia shrublands. Movements are not well known, however, they are thought to be resident or sedentary, but may undertake some local movements (Department of Environment and Conservation 2006b), possibly in response to drought and food availability (Pizzey & Knight 1997). Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than one to five metres above the ground (Higgins & Peter 2002).

Black-chinned Honeyeater - eastern subspecies (*Melithreptus gularis gularis*)

This species occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. It also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees (Department of Environment and Conservation 2006b). It is a gregarious species usually seen in pairs and small groups of up to 12 birds (Higgins & Davies 1996). Feeding territories are large, making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least five ha. Nectar is taken from flowers, and honeydew is gleaned from foliage (Higgins & Davies 1996).

Painted Honeyeater (*Grantiella picta*)

Painted Honeyeaters occur in dry forests and woodlands. The primary food is mistletoes in the genus Amyema, although they will take some nectar and insects (Department of Environment and Conservation 2006b). The breeding distribution is dictated by the presence of mistletoes, which are largely restricted to older trees. The species is less likely to be found in strips of remnant box-ironbark woodlands, such as occur along roadsides and in windbreaks, than in wider blocks (Garnett & Crowley 2000).

Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)

The Grey-crowned Babbler is found mainly in rural districts where it predominantly lives in roadsides and private land (Schulz 1991). Suitable habitats are usually abundant with leaf litter and debris; often dominated by eucalypts including box and ironbark species, partly-cleared woodland, acacia shrubland and adjoining farmland (Higgins 1999). Grey-crowned Babblers is unlikely to occur in regrowth forest, large patches of forest or woodland and forest with dense understorey or grassland with few trees (Schulz 1991).

An understorey of young trees and shrubs, in the 10 to 25 cm diameter at breast height range, is used for nest sites and shelter, and a relatively sparse ground layer with more litter and less ground cover is preferred by the species (Adam & Robinson 1996). Within that broad habitat category, they prefer sites with large trees, a scattered understorey of small trees or shrubs and a sparse ground layer of litter and short grass (Davidson & Robinson 1992). At the local scale, the species is common in edge habitats where there is access to both tree-cover and open ground. Historically this edge habitat would be found near larger trees in mature woodland habitat, but is now largely restricted to roadside vegetation and the edges of remnant patches (Robinson *et al.* 2001). The Grey-crowned Babbler is a prolific nest builder, building nests throughout the year for both breeding and roosting (Counsilman 1979), and defend a territory of approximately 10 ha, however territories up to 50 ha have been recorded.

Speckled Warbler (*Pyrrholaemus sagittatus*)

Speckled Warblers prefers eucalypt dominated vegetation that has a grassy understorey, often on rocky ridges or in gullies (NSW Scientific Committee 2001b). The bird is a sedentary species that breeds in pairs and trios, and feeds on seeds and insects on the ground and in understorey vegetation and builds domed nests on the ground in grass tussocks, dense leaf litter and fallen branches (Reid 1999). Speckled Warblers occur at low densities (0.19-0.54 per ha) and have relatively large home ranges of 6-12 ha for pairs or trios of birds (Higgins & Peter 2002).

Diamond Firetail (*Stagonopleura guttata*)

Diamond Firetails are found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Woodlands. They occur also in open forest, mallee, native grasslands, and in secondary grasslands derived from other communities (Trail & Duncan 2000). They feed exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). They are usually encountered in flocks of between five and 40 birds, with groups separating into small colonies to breed, between August and January (Department of Environment and Conservation 2006b). Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. The species appears to be sedentary, although some populations move locally (Higgins & Peter 2002).

Varied Sittella (*Daphoenositta chrysoptera*)

The Varied Sittella is sedentary and inhabits most of mainland Australia, with a nearly continuous distribution in NSW from the coast to the far west (Higgins & Peter 2002). It inhabits open eucalypt forests and woodlands (particularly rough-barked species), mallee, inland acacia woodland and coastal tea-tree scrubs (Pizzey & Knight 2007).

Varied Sittella are highly social, with groups foraging together, whereby they fly into the heads of trees and generally make their way down limbs and the trunk of the tree. They feed on arthropods, which are gleaned from dead branches, small branches in the canopy and crevices from rough or decorticating bark (NSW Scientific Committee 2009c). This species typically breeds in groups of five to seven individuals during spring and summer, with nests well camouflaged and situated in a fork, high in the living tree canopy. The same fork or tree is often used in successive years. During winter this species forms larger companies.

The threats that affect Varied Sittella include the continued decline in habitat cover and quality (Watson *et al.* 2005). Furthermore, cleared agricultural landscapes potentially act as a barrier to movement and dispersal due the sedentary nature of this species. Thus, survival and population viability is considered sensitive to processes such as reduction in patch size and isolation and simplification of habitat including the removal of canopy cover, logs, fallen branches and litter. Therefore, three Key Threatening Processes listed under the TSC Act affect this species; clearing of native vegetation, loss of hollow-bearing trees and the removal of dead wood and dead trees.

8.1 TSC Act significance assessment

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

One threatened woodland species of bird was recorded during recent field surveys (Grey-crowned Babbler). Previous field studies associated with Boggabri Coal have recorded all of these species in the locality. It is therefore assumed that approximately 7.5 ha of potential habitat would be affected by the proposed Modification. This habitat provides potential foraging, roosting and breeding resources for the species. This area is a small portion of the available habitats in the area.

Any species located in the proposed Modification area would be considered a small patch of a larger meta-population therefore it is unlikely that the local population would be placed at risk of extinction by the proposed Modification.

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

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

It is estimated that approximately 7.5 ha of potential threatened woodland bird habitat would be affected by the proposed Modification. However, this habitat is not considered to be core and similar habitat of equal or greater quality exists in the adjacent landscapes.

Specific habitat features likely to be affected include down timber (used for foraging) and mature trees with mistletoe that is used by Painted Honeyeater which is a specialist forager.

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

Available threatened woodland bird habitat in the locality is considered to be already fragmented, with the exception of Leard State Forest which occurs as a continuous patch of woodland vegetation. It is unlikely that the proposed Modification would contribute significantly to the fragmented state of woodland bird habitat however it would add incrementally to the impacts associated with the BCEP Project.

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

Due to the small size of the sites, any species within the Modification is as are considered a small proportion of a larger meta-population and are therefore not considered to be important to the long-term survival of the assessed species in the locality.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species. Habitat occurring adjacent to the proposed Modification area in the remaining Leard State Forest, is considered to represent ‘core habitat’, particularly for sedentary species including Brown Treecreeper, Hooded Robin, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail and Varied Sittella.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery or threat abatement plans have been prepared for the threatened woodland bird species being assessed. The Office of Environment and Heritage has identified a number of priority actions for the recovery

of each of these species, except the Varied Sittella. The proposed Modification will not interfere significantly with any of these priority actions.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to threatened woodland bird species, the proposed Modification contributes to one key threatening process – clearing of native vegetation. As the proposed Modification will only make a minor contribution to this threatening process it is considered unlikely to significantly affect species.

Conclusion

One threatened woodland bird species was recorded during the surveys. In previous studies conducted for Boggabri Coal eight threatened woodland species have been recorded in the locality, including Brown Treecreeper, Hooded Robin, Black-chinned Honeyeater, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail and Varied Sittella.

It is estimated that 7.5 ha of potential habitat would be affected by the proposed Modification. This is made up of the following vegetation communities within the proposed Modification area:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- River Red Gum riparian woodlands and forests (Moderate Condition).
- Weeping Myall Woodland.

Similar habitats of equal or greater quality will remain within and surrounding the boundaries of the proposed Modification. Populations, if present, are considered to be small patches of a larger metapopulation. The proposed Modification is unlikely to increase fragmentation. Based on the above assessment, woodland birds are unlikely to be significantly impacted by the proposed Modification, however the impacts add incrementally to those associated with the BCEP Project.

9. Spotted Harrier (*Circus assimilis*)

Status

The Spotted Harrier is listed as a Vulnerable species under the TSC Act.

Distribution, habitat and ecology

The Spotted Harrier is widespread throughout most of the Australian mainland. Individuals disperse widely, with this species being nomadic and irruptive in response to local conditions (food abundance). The Spotted Harrier occupies grassy open woodland, inland riparian woodland and grasslands, but is most commonly associated with native grassland and agricultural environments (NSW Scientific Committee – preliminary determination). This species builds a stick nest in open or remnant woodland and generally breeds from August to December or February to April (Pizzey & Knight 2007). The diet of the Spotted Harrier generally consists of terrestrial mammals (rodents), birds (quail) and reptiles (NSW Scientific Committee 2009b).

Threats

The main threat that affects this species is the clearing and degradation of foraging and breeding habitat, particularly where it affects prey densities. Other threats include the possibility of secondary poisoning from rodenticides and pindone used to control rabbits (NSW Scientific Committee 2009b).

Specific impacts

This species was recorded in agricultural land associated with BCEP during field studies and is frequently observed within and around the proposed Modification area. The proposed Modification would disturb 69.2 ha of potential habitat for this species, including all the vegetation communities present in the proposed Modification area.

9.1 TSC Act significance assessment

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

The Spotted Harrier was recorded in agricultural land associated with BCEP during field studies in 2010.

Approximately 69.2 ha of potential foraging habitat would be affected by the proposed Modification this area is considered to be potential foraging habitat.

This species is more commonly associated with native grasslands and agricultural landscapes, where they hunt low over the ground searching for prey. While the proposed Modification would affect 69.2 ha of potential foraging habitat, similar habitat would remain in the area. This area is considered known foraging habitat due to sightings during previous field surveys.

While the proposed Modification would remove foraging habitat, it is not likely that the lifecycle of this species would be affected. Potential nesting and nesting habitats would remain in the locality post-development. The mobility of the species would not restrict breeding mechanisms and allow dispersal to similar, higher quality habitat in the locality.

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

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

Approximately 69.2 ha of known foraging habitat (grassland and agricultural crops, similar to where this species was recorded during previous studies) would be affected by the proposed Modification. This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. Similar habitats would remain in the locality post-development.

The associated BCEP could potentially create new habitat for this species at the completion of mining activities when the subject site (particularly the open cut pit) is likely to be rehabilitated.

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

Spotted Harrier is widespread throughout most of the Australian mainland, except in densely forest or wooded habitats of the coast. While this species is widespread, individuals are sparsely distributed, with this species being nomadic and irruptive in response to local conditions. The ability for the Spotted Harrier to access adjacent habitat would remain. As such, it is unlikely that the proposed Modification will fragment or isolate the Spotted Harrier habitat to individuals or a local population's detriment. However, it would reduce the overall extent of known habitat to a small degree and further exacerbate key threatening processes for these species.

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

This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. Extensive areas of similar habitats would remain in the locality post-development.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species due to its listing as a Vulnerable species.

The areas proposed for the works are not considered to be critical to the survival of this species due to their small size.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Neither a recovery nor threat abatement plan has been prepared for the Spotted Harrier. In the interim, the Office of Environment and Heritage have identified 2 management actions for the Spotted Harrier (refer to Table 9.1). The project is not likely to affect any of these management actions.

Table 9.1 Management actions for Spotted Harrier

Management action for Spotted Harrier	Likely to be affected by the project
Raise awareness about poisoning of non-target species from baiting and rodenticides (Spotted Harrier).	No
Encourage retention of intact foraging and breeding habitat through PVP process(Spotted Harrier).	No

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The proposed Modification would involve a small amount of clearing of native vegetation, which is a known threatening process for this species. Whilst extensive areas of similar habitats would remain in the locality post-development, the proposed Modification would contribute to the threatening process.

Conclusion

This species was not observed during field survey for the proposed Modification, however, the Spotted Harrier was recorded foraging over grassland and agricultural crops during surveys for the BCEP Project and is frequently observed within the grasslands within and directly adjoining the proposed Modification area. 69.2 ha of potential foraging habitat would be affected by the proposed Modification. The area affected is not considered to represent core habitat for this species.

As this species is likely to exist in similar agricultural environments and remnant vegetation in the locality, it is not likely that this species would be significantly affected by the proposed Modification.

10. Black Falcon (*Falco subniger*)

Status

The Black Falcon is listed as a Vulnerable species under the TSC Act.

Distribution, habitat and ecology

The Black Falcon is widespread but sparsely distributed throughout most of inland NSW. This species generally occurs as solitary individuals, in pairs or in family groups of parents and offspring.

Threats

The main threat that affects this species is the clearing and degradation of foraging and breeding habitat, particularly where it affects prey densities. Other threats include the possibility of secondary poisoning from rodenticides and pindone used to control rabbits and disturbances to nesting activity from over-abundant ravens and cockatoos (NSW Scientific Committee 2013).

Specific impacts

This species has been previously recorded in agricultural land associated with BCEP during previous field studies and is occasionally observed within and around the proposed Modification area. The proposed Modification would remove 69.2 ha of potential habitat for this species, including all the vegetation communities present in the proposed Modification area.

10.1 TSC Act significance assessment

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

The Black Falcon has been recorded in agricultural land associated with BCEP during previous field studies.

Approximately 69.2 ha of potential foraging habitat would be affected by the proposed Modification this area is considered to be potential foraging habitat.

This species is more commonly associated with native grasslands and agricultural landscapes, where they hunt low over the ground searching for prey. While the proposed Modification would affect 69.2 ha of potential foraging habitat, similar habitat would remain and exist in the area after consturction. This area is considered known foraging habitat due to sightings during previous field surveys.

While the proposed Modification would remove foraging habitat, it is not likely that the lifecycle of this species would be affected. Potential nesting and nesting habitats would remain in the locality post-development. The mobility of the species would not restrict breeding mechanisms and allow dispersal to similar, higher quality habitat in the locality.

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

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

Approximately 69.2 ha of known foraging habitat (grassland and agricultural crops, similar to where this species was recorded during previous studies) would be affected by the proposed Modification. This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. Similar habitats would remain in the locality post-development.

The associated BCEP could potentially create new habitat for this species at the completion of mining activities when the subject site (particularly the open cut pit) is likely to be rehabilitated.

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

Black Falcon is widespread throughout most of inland NSW, except in densely forest or wooded habitats of the coast. While this species is widespread, individuals are sparsely distributed, with this species being nomadic and irruptive in response to local conditions. The ability for the Black Falcon to access adjacent habitat would remain. As such, it is unlikely that the proposed Modification will fragment or isolate the Black Falcon habitat to individuals or a local population's detriment. However, it would reduce the overall extent of known habitat to a small degree and further exacerbate key threatening processes for these species.

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

This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. Extensive areas of similar habitats would remain in the locality post-development.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species due to its listing as a Vulnerable species.

The areas proposed for the works are not considered to be critical to the survival of this species due to their small size.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Neither a recovery nor threat abatement plan has been prepared for the Black Falcon. In the interim, the Office of Environment and Heritage have identified 8 management actions for the Black Falcon (refer to Table 10.1). The project is not likely to affect any of these management actions.

Table 10.1 Management actions for Black Falcon

Management action for Black Falcon	Likely to be affected by the project
Protect and monitor known nest sites (Black Falcon).	No
Protect old stick nests (e.g., those of corvids and raptors) that have the potential to be used as nest sites (Black Falcon).	No
Protect and facilitate the recruitment of large old trees, a resource that is critical for nesting and hunting (Black Falcon).	No
Protect and expand potential nesting habitat, especially riparian and floodplain woodlands (Black Falcon).	No
Identify Black Falcon nesting territories and engage landholders in the management of habitat in these areas (Black Falcon).	No
Promote the reporting of any signs of disease that are unusual or clusters of deaths in raptors or their prey to the NSW Environment Line on 131 555 (Black Falcon).	No
Investigate the dietary importance of terrestrial ground birds and rabbits, and the potential for agricultural activities to benefit or negatively impact on falcon populations (Black Falcon).	No
Increase community awareness of the Black Falcon through the preparation and distribution of educational material, including an identification guide (Black Falcon).	No

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The proposed Modification would involve a small amount of clearing of native vegetation, which is a known threatening process for this species. Whilst extensive areas of similar habitats would remain in the locality post-development, the proposed Modification would contribute to the threatening process.

Conclusion

This species was not observed during field survey for the proposed Modification, however, the Black Falcon has been previously recorded foraging over grassland and agricultural crops within the Modification areas on occasions within the grasslands. 69.2 ha of potential foraging habitat would be affected by the proposed Modification. The area affected is not considered to represent core habitat for this species.

As this species is likely to exist in similar agricultural environments and remnant vegetation in the locality, it is not likely that this species would be significantly affected by the proposed Modification.

11. Little Lorikeet (*Glossopsitta pusilla*)

Status

The Little Lorikeet is listed as a Vulnerable species under the TSC Act 1995.

Distribution and habitat

The Little Lorikeet inhabits forests and woodlands, with most associations occurring in dry, open eucalypt forest and woodlands (Office of Environment and Heritage 2011c).

Threats

Key threats to this species include:

- Extensive clearing of woodlands for agriculture. Small scale clearing, such as during road works and fence construction, continues to destroy habitat and it will be decades before revegetated areas supply adequate forage sites.
- The loss of old hollow bearing trees has reduced nest sites, and increased competition with other native and exotic species that need large hollows with small entrances to avoid predation. Felling of hollow trees for firewood collection or other human demands increases this competition.
- Competition with the introduced Honeybee for both nectar and hollows exacerbates these resource limitations.

Specific impacts

No little lorikeet specimens were recorded during the survey. The species is considered to have a moderate likelihood of occurring in the areas of the proposed Modification. The proposed Modification will remove 7.5 ha of potential habitat for this species. Vegetation communities within the proposed Modification area which are considered potential habitat for this species are;

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

No little lorikeet was located during surveys, however habitat for little lorikeet was identified within the woodlands within the proposed Modification area.

A total of 7.5 ha of potential habitat will be removed as a result of the proposed Modification.

11.1 TSC Act significance assessment

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

The Little Lorikeet is dependent on flowering resources across a wide range of habitats (woodlands and forests). Breeding and nesting occurs from May – September close to feed areas and typically in riparian areas (OEH 2012).

As the impact area is 7.5 ha it is unlikely that the lifecycle of this opportunistic species would be significantly affected, considering that there is larger areas of foraging and breeding habitat for this species within the wider region.

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

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

It is estimated that 7.5 ha of potential foraging habitat for the assessed species will be affected by the proposed Modification. Given the mobility of this species, it is not considered to be significant in terms of the available (potential) habitat in the wider locality.

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

As the Little Lorikeet is dependent on flowering resources across a wide range of already fragmented habitat, it is unlikely that the removal of 7.5 ha of native vegetation will significantly affect these species. The likelihood of isolation is also low due to their mobility.

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

This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. Similar habitats would remain in the locality post-development.

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

Critical habitats are areas of land crucial to the survival of particular threatened species, population or ecological community. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species.

Due its high mobility, the Little Lorikeet is capable of accessing off-site habitat resources. Therefore the habitat that is present is not considered to be critical to the survival of the species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

There are no recovery threat abatement plans or priority actions prepared for the Little Lorikeet under the TSC Act. In the interim, the Office of Environment and Heritage have identified 2 management actions for the Little Lorikeet (refer to Table 11.1). The project is not likely to affect any of these management actions.

Table 11.1 Management actions for Little Lorikeet

Management action for Little Lorikeet	Likely to be affected by the project
Encourage retention of old-growth and hollow-bearing trees through community engagement and other mechanisms including PVPs, BioBanking and EIA (Little Lorikeet)	No
Avoid burning woodland with old-growth and hollow-bearing trees (Little Lorikeet)	No

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to the Little Lorikeet, the proposed Modification contributes to one key threatening process – clearing of native vegetation. As the proposed Modification will only make a minor contribution to this threatening process it is considered unlikely to significantly affect species.

Conclusion

Within the survey area potential foraging resources were located in the following vegetation communities within the proposed Modification area:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

7.5 ha of potential habitat for the little lorikeet would be affected by the proposed Modification. However, given the species high mobility and ability to access remnant woodland in the locality and region, it is not likely that this species would be significantly affected by the proposed Modification. Although it would further exacerbate key threatening processes that affect this species.

12. Swift Parrot (*Lathamus discolour*)

Status

The Swift Parrot is listed as Endangered under the TSC Act and the EPBC Act.

Distribution and habitat

Breeding occurs in Tasmania, migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW.

In mainland Australia the species is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering *Acacia pycnantha*, is indicated. Sites used vary from year to year (Garnett & Crowley 2000),(Swift Parrot Recovery Team 2001).

Threats

Key threats to this species include:

- On the mainland the main threat is loss of habitat through clearing for agriculture, and urban and industrial development.
- Collisions with wire netting fences, windows and cars, during the breeding season and winter migration (especially where such obstacles are in close proximity to suitable habitat).

Specific impacts

No Swift Parrot specimens were recorded during field surveys. The species is considered to have a moderate likelihood of occurring in the areas of the proposed Modification. The proposed Modification will remove 7.5 ha of potential woodland habitat for this species including the following vegetation communities:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

12.1 TSC Act significance assessment

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

The Swift Parrot is an opportunistic blossom nomad dependent on flowering resources across a wide range of habitats (woodlands and forests). The removal of 7.5 ha of habitat containing suitable foraging trees for these species is highly unlikely to disrupt their lifecycle. However, given the species high mobility and ability to access remnant woodland in the locality and region, it is not likely that this species would be significantly affected by the proposed Modification.

Breeding events for the Swift Parrot occur during summer in Tasmania so no critical breeding habitat will be affected by the proposed Modification. It is therefore considered that the proposed Modification is not likely to affect the lifecycle of this species.

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

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

It is assumed that approximately 7.5 ha of potential foraging habitat for the assessed species will be affected by the proposed Modification. Given the mobility of this species, it is not considered to be significant in terms of the available (potential) habitat in the wider locality.

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

As the Swift Parrot is dependent on flowering resources across a wide range of already fragmented habitat, it is unlikely that the removal of 7.5 ha of native vegetation will significantly affect these species. The likelihood of isolation is also low due to their mobility.

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

This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. Similar habitats would remain in the locality post-development.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, population or ecological community. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species.

As previously mentioned, due its high mobility, these species are capable of accessing off site habitat resources. Moreover, Swift Parrots breed in spring/ summer in Tasmania and as such, no breeding habitat would be affected by the proposed Modification. It is therefore considered that the proposed Modification will not have an adverse effect on critical habitat.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for the Swift Parrot under the TSC Act. In the interim, the Office of Environment and Heritage have identified 13 management actions for the Swift Parrot (refer to Table 12.1). The project is not likely to affect any of these management actions.

Table 12.1 Management actions for Swift Parrot

Management action for Swift Parrot	Likely to be affected by the project
Identify and map the extent and quality of Swift Parrot foraging and roosting habitat on private and public land	No
Protect, manage and restore Swift Parrot habitat on private land through conservation agreements, management agreements and incentive payments.	No
Develop and distribute EIA guidelines to decision makers (Swift Parrot)	No
Enhance habitat for Swift Parrots by planting suitable tree species to complement natural regeneration or to enhance remnants	No
Develop and distribute Swift Parrot habitat identification, management and enhancement guidelines	No
Reduce the incidence of Swift Parrot collisions by raising community awareness of the threat of man-made hazards	No
Coordinate volunteer surveys at known and potential Swift Parrot sites on private and public land	No
Conduct Swift Parrot habitat research on both private and public land	No
Employ community liaison officer to coordinate conservation actions for the species, including maintenance of community and volunteer networks (Swift Parrot)	No
Consult and involve indigenous community through employment of community liaison officer (Swift Parrot)	No
Compile, produce and distribute the annual Swift Parrot volunteer newsletter “Swifts Across the Strait”	No
Manage the recovery process through the continued operation of the National Swift Parrot Recovery Team	No
Finalise review of National Recovery Plan by 2007 (Swift Parrot)	No

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to the Swift Parrot the proposed Modification contributes to one key threatening process – clearing of native vegetation. As the proposed Modification will only make a minor contribution to this threatening process it is considered unlikely to significantly affect this species.

Conclusion

Potential foraging resources were located in the proposed Modification area within the following vegetation communities:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

It is estimated that 7.5 ha of potential winter foraging habitat for the Swift Parrot would be affected by the proposed Modification. However, given the species high mobility and ability to access adjacent remnant habitat in the locality and region, it is not likely that this species would be significantly affected by the proposed Modification. However, it would further exacerbate key threatening processes that affect this species.

12.2 EPBC Act significance assessment

The Swift Parrot is listed as Endangered under the EPBC Act.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will result in one or more of the following.

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

Potential foraging habitat for this species exists in the proposed Modification area, however the extent proposed to be removed represents a very small proportion of available habitat in the locality. As Swift Parrots breed in Tasmania and given the high mobility of this species, no breeding resources would be affected by the proposed Modification. Therefore, it is considered unlikely that the proposed Modification would lead to a long-term decrease in this species.

Reduce the area of occupancy of the species

The proposed Modification will remove 7.5 ha of foraging habitat for this species. This area is relatively small in terms of the extent of similar or greater quality habitat available in the proposed Modification area and surrounding landscape.

Fragment an existing population into two or more populations

Owing to the mobility of this species, the proposed Modification is unlikely to fragment any populations potentially present.

Adversely affect habitat critical to the survival of a species

No critical habitat is listed for this species. Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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 (Department of Environment, 2013).

The proposed Modification would remove 7.5 ha of suitable winter foraging habitat. As this species is highly mobile, it is likely that the abundance of higher quality foraging resources in the locality would be used by locally occurring Swift Parrots. As such the habitat within the proposed Modification area is not considered to be critical to the survival of the species.

Disrupt the breeding cycle of a population

Swift Parrots breed in Tasmania during spring and summer, migrating to south-eastern Australia during autumn and winter (Department of Environment and Conservation 2006b). While Swift Parrots are dependent on flowering resources across a wide range of habitats (woodlands and forests) within their NSW wintering grounds, the removal of 7.5 ha of suitable habitat is not likely to disrupt their migratory patterns. As such, the proposed Modification is not likely to affect their breeding cycle.

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

The proposed Modification will remove 7.5 ha of potential foraging habitat for this species. This area of potential habitat is relatively small in terms of the extent of similar or greater quality habitat within the surrounding landscape. As such, it is unlikely that the proposed Modification would cause the Swift Parrot to decline.

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

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Swift Parrot would become further established as a result of the proposed Modification.

Introduce disease that may cause the species to decline, or

It is not likely that disease would be increased by the proposed Modification.

Interfere with the recovery of the species.

The Action Plan for Australian Birds (Garnett & Crowley 2000) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific breeding requirements.

Specific objectives of the Swift Parrot Recovery Plan (Swift Parrot Recovery Team 2001) include:

- identify priority habitats and sites across the range of the Swift Parrot
- implement management strategies to protect and improve priority habitats and sites resulting in a sustained improvement in carrying capacity
- reduce the incidence of collisions with man-made structures
- determine population trends within the breeding range
- quantify improvements in carrying capacity by monitoring changes in extent and quality of habitat
- increase public awareness about the recovery program and to involve the community in the recovery.

Owing to the small extent of potential habitat to be removed and its location outside of listed priority habitats, it is considered that the proposed Modification will not interfere substantially with the recovery of the Swift Parrot.

Conclusion

Potential habitat for the Swift Parrot was present within the proposed Modification area within the following vegetation communities:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

This species is considered to have a moderate-high likelihood of occurrence within the proposed Modification area. The proposed Modification would remove 7.5 ha of potential habitat for the Swift Parrot, which represents a small proportion of available habitat in the locality. Owing to the mobility of the species and small extent of potential habitat to be removed, the proposed Modification is unlikely to significantly impact upon this species or interfere with its recovery.

13. Regent Honeyeater (*Xanthomyza phrygia*)

Status

The Regent Honeyeater is listed as Endangered and Migratory under the EPBC Act 1999 and Critically Endangered under the TSC Act 1995. Under the Environment Protection and Biodiversity Conservation Act 1999 important habitat for migratory species includes areas where the species is declining. Given that this species is endangered, it can be considered to be declining within the proposed Modification area and the wider locality. This species is therefore assessed using the threatened species criteria of the Principal Significance Guidelines 1.1 (Department of the Environment and Heritage 2006a).

Distribution, habitat and ecology

Regent Honeyeaters inhabit dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak (Department of Environment and Conservation 2006b). The woodlands they inhabit support a significantly high abundance and species richness of bird. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes (Higgins *et al.* 2001).

The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Nectar and fruit from the mistletoes *Amyema miquelii, A. pendula* and *A. cambagei* are also eaten during the breeding season (Oliver 2000). When nectar is scarce, lerp and honeydew comprise a large proportion of the diet. Insects make up about 15 % of the total diet and are important components of the diet of nestlings (Higgins *et al.* 2001). A shrubby understorey is an important source of insects and nesting material (Oliver *et al.* 1998).

Colour-banding of Regent Honeyeater has shown that the species can undertake large-scale nomadic movements in the order of hundreds of kilometres (Higgins *et al.* 2001). However, the exact nature of these movements is still poorly understood. It is likely that movements are dependent on spatial and temporal flowering and other resource patterns. To successfully manage the recovery of this species a full understanding of the habitats used in the non-breeding season is critical (Department of Environment and Conservation 2006b).

There are three known key breeding areas, two of them in NSW — Capertee Valley and Bundarra-Barraba regions (Geering & French 1998). The species breeds from May to March, but with peak breeding activity from September to November (NSW Department of Environment and Climate Change 2009b) in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River She-oak. Regent Honeyeaters usually nest in horizontal branches or forks in tall, mature eucalypts and She-oaks (Oliver 2000). An open cup-shaped nest is constructed of bark, grass, twigs and wool (Oliver *et al.* 1998).

Threats

Threats to this species include:

- Historical loss, fragmentation and degradation of habitat from clearing for agricultural and residential development, particularly fertile Yellow Box-White Box-Blakely's Red Gum woodlands.
- Continuing loss of key habitat tree species and remnant woodlands from strategic agricultural developments, timber gathering and residential developments.
- Suppression of natural regeneration of over storey tree species and shrub species from overgrazing. Riparian gallery forests have been particularly affected by overgrazing.
- Inappropriate forestry management practices that remove large, mature resource-abundant trees. Firewood harvesting in Box-Ironbark woodlands can also remove important habitat components.

- Competition from larger aggressive honeyeaters, particularly Noisy Miners, Noisy Friarbirds and Red Wattlebirds.
- Egg and nest predation by native birds (Department of Environment and Conservation 2006b).

Specific impacts

This species was not recorded during surveys for the BCEP project or the proposed Modification, however habitat exists within the Box Gum habitats of the proposed Modification area, including:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

Approximately 7.5 ha of potential habitat will be removed as a result of the Modification. Whilst this small area will add incrementally to the loss of habitat for the Regent Honeyeater it is small in comparison to larger areas of this community present in the wider region.

13.1 TSC Act significance assessment

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

It is assumed that 7.5 ha of potential habitat for this species, including foraging, roosting and nesting resources would be affected by the proposed. The proposed Modification areas are situated approximately 50 km to the south-west of one of only two main breeding locations in NSW, being the Bundarra-Barraba area. While this species has not been recorded in the BCEP project area, the presence of large tracts of suitable habitat coupled with records of this species occurring west to the Pilliga Nature Reserve (NSW Department of Environment and Climate Change 2009b), indicate that the proposed Modification area might be utilised at least on a transient basis. While this species may exhibit some fidelity to nesting areas, pairs have also been recorded breeding up to 75 km from sites used in the previous breeding season (Oliver 1998) (Oliver 2000) (Geering & French 1998) (Oliver *et al.* 1998). However, any identified population of Regent Honeyeater in the area would not be restricted to habitat within the subject site, due to the species' large home range, similar foraging and nesting habitat can be accessed in the local area. Although the proposed Modification may temporarily affect the dynamics of any potential local population, it is not likely to affect the lifecycle of this species, but would exacerbate key threatening processes that currently undermine this species recovery.

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

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

7.5 ha of habitat is likely to be removed or modified as a result of the proposed Modification. This is in addition to the incremental loss of habitat for this species.

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

The habitat within the project area is already largely fragmented. Removal of 7.5 ha of potential habitat for the species would not affect habitat connectivity to a level that would impact upon the conservation of the species, especially considering the high mobility of the species.

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

Whilst the proposed Modification will result in a small incremental loss in habitat it is unlikely to significantly affect the long term survival of the Regent Honeyeater.

This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential breeding and foraging opportunities. Similar habitats would remain in the locality post-development.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act 1995, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

The Office of Environment and Heritage has established four management sites for conservation and management of this species, including Bundarra-Barraba (Gunnedah/Gwydir and Tamworth region), Lower Hunter Valley (Cessnock), Capertee Valley (Lithgow) and Taronga Zoo. The Bundarra-Barraba management site is located to the east of the proposed modification area and does within any of the remaining identified management sites and the proposed modification is not likely to adversely affect any of the recovery actions of the Regent Honeyeater.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to the Regent Honeyeater the proposed Modification contributes to one key threatening process – loss of foraging habitat (mature key nectar tree species & mistletoe). As the proposed works will only make a minor contribution to this threatening process it is considered unlikely to significantly affect species.

Conclusion

Approximately 7.5 ha of potential habitat will be removed by the proposed Modification. This is made up of the following vegetation communities present within the proposed Modification area:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

It is unlikely that removal of this small amount of woodland would have a significant impact upon the Regent Honeyeater.

13.2 EPBC Act significance assessment

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

The subject site boundary is situated approximately 50 km to the south-west of one of only two main breeding locations in NSW, being the Bundarra-Barraba area. The presence of large tracts of suitable habitat coupled with records of this species occurring west to the Pilliga Nature Reserve (NSW Department of Environment and Climate Change 2009b), indicate that the subject site might be utilised on a transient basis. However, any identified population of Regent Honeyeater in the area would not be restricted to habitat within the subject site, due to the species' large home range, similar foraging and nesting habitat can be accessed in the locality. Therefore, the proposed Modification is not likely to result in a decline of the local population.

Will the action reduce the area of occupancy of the species?

The subject site is situated approximately 50 km to the south-west of one of only two main breeding locations in NSW, being the Bundarra-Barraba area (NSW Department of Environment and Climate Change 2009b). Furthermore, this species is known to disperse widely (Higgins *et al.* 2001), and with records occurring west to the Pilliga Nature Reserve (NSW Department of Environment and Climate Change 2009b), it is considered that this species might utilise habitat resources within the proposed Modification area on at least a transient basis. Although the species is highly mobile, which is likely to be in response to spatial flowering and resources (Higgins *et al.* 2001), the removal of 7.5 ha of potential habitat would reduce the area of occupancy for the Regent Honeyeater. However this is unlikely to be significant due to the small area of removal.

Will the action fragment an existing population into two or more populations?

Regent Honeyeaters are highly mobile and have a large foraging range that enables them to access similar habitat resources in the locality. Therefore, it is not likely that the proposed Modification would isolate habitat or fragment an existing population into two or more populations.

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

The Regent Honeyeater is known to breed in two main areas in NSW, being the Bundarra-Barraba area and Capertee Valley. Regent Honeyeater's typically occur in associations that support species which produce copious amounts of nectar, including *Eucalyptus albens*. They are also associated with woodland that support *E. blakelyi, E. crebra* and sometimes native Callitris (pine) woodlands mixed with eucalypts (NSW Department of Environment and Climate Change 2009b). The Modification supports *Eucalyptus albens* and *E. crebra*, and thus, with the Modification occurring in proximity to a known breeding area, it potentially provides important breeding resources for this species. However, as this species would not be restricted to habitat within the Modification study area, this area may not be considered critical to the survival of this species.

Will the action disrupt the breeding cycle of a population?

The proposed Modification would affect 7.5 ha of potential habitat for this species, including foraging and nesting resources. Furthermore, the Modification study area occurs approximately 50 km from one of two main locations where this species is concentrated, being the Bundarra-Barraba area (NSW Department of Environment and Climate Change 2009b), While this species may exhibit some fidelity to nesting areas, pairs have also been recorded breeding up to 75 km from sites used in the previous breeding (Oliver 1998) (Oliver 2000) (Geering & French 1998) (Oliver *et al.* 1998). Therefore, while this species may utilise habitat resources in the Modification study area on at least a transient basis, the removal of 7.5 ha of potential habitat is not likely to disrupt the breeding cycle of a potential population of Regent Honeyeater. It will however add incrementally to the processes threatening this species.

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

The modification study area occurs approximately 50 km to the south-west of one, of only two main locations where this species is concentrated in NSW, being the Bundarra-Barraba area (NSW Department of Environment and Climate Change 2009b). The removal of 7.5 ha of vegetation would not significantly modify, destroy, remove and decrease the availability of habitat for Regent Honeyeater, although it adds to the incremental loss of habitat for this species.

Will the action result in invasive species that are harmful to an endangered species becoming established in the endangered species´ habitat?

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Regent Honeyeater would become further established as a result of the proposed modification.

Will the action introduce disease that may cause the species to decline?

No. It is not likely that disease would be increased by the removal of a small area of habitat for the proposed modification.

Will the action interfere with the recovery of the species?

The Action Plan for Australian Birds (Garnett & Crowley 2000) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific breeding requirements.

Specific objectives of the Regent Honeyeater recovery plan (Menkhorst *et al.* 1999) include:

- Maintain and enhance the value of Regent Honeyeater habitat at the key sites and throughout the former range, by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites.
- Monitor trends in the Regent Honeyeater population size and dispersion across its range to allow assessment of the efficacy of management actions
- Facilitate research on strategic questions that will enhance the capacity to achieve the long-term objectives. In particular, determine the whereabouts of Regent Honeyeaters during the non-breeding season and during breeding season absences from known sites. Identify important sites and habitat requirements at these times.
- Maintain and increase community awareness, understanding and involvement in the recovery effort
- Maintain the captive population of Regent Honeyeaters at a size that will provide adequate stock to: provide insurance against the demise of the wild population; continuously improve captive-breeding and husbandry techniques; provide adequate stock for trials of release strategies; and maintain 90 % of the wild heterozygosity in the captive population.

It is not likely that the proposed modification will significantly interfere with the recovery of the species.

Conclusion

Populations of Regent Honeyeaters in the locality are considered important, particularly those using the area for breeding resources. It is considered unlikely that the proposed Modification would significantly affect the species. However, the proposed Modification would add incrementally to the processes threatening this species, through the removal of 7.5 ha of potential habitat, including:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.

- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

Whilst a small area of habitat for this species will be removed it is unlikely that this will lead to a significant impact for this species.

14. Superb Parrot (*Polytelis swainsonii*)

Status

The Superb Parrot is listed as Vulnerable under both the EPBC Act 1999 and TSC Act 1999.

Distribution, habitat and ecology

Superb Parrots inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. On the South-west Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box (Higgins 1999). This species nests in small colonies, often with more than one nest in a single tree, and breed between September and January (Department of Environment and Conservation 2006b). Part of the population of this species undertakes regular seasonal movements from the south-west slopes region to the eucalypt–pine woodlands of central-north and central-west NSW, with the range extending north to around Narrabri and Wee Waa (Department of Environment Water Heritage & Arts 2009)

Superb Parrots may forage up to 10 km from nesting sites, primarily in grassy box woodland. They feed in trees and understorey shrubs and on the ground; their diet consists mainly of grass seeds and herbaceous plants. The parrots also eat fruits, berries, nectar, buds, flowers, insects and grain (Higgins 1999)

Threats

Threats to this species include:

- poor regeneration of nesting trees and food resources
- removal of hollow-bearing trees
- clearing of woodland remnants
- feeding on grain spills and subsequently being struck by vehicles
- loss of hollows to feral bees and native and exotic hollow-nesting birds
- illegal trapping which can also result in the destruction of hollows (Department of Environment and Conservation 2006b).

Specific impacts

This species was not recorded during surveys for the BCEP project or the proposed Modification; however habitat exists within the woodlands and open forest habitat of the proposed Modification area, including the following vegetation communities:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

Approximately 7.5 ha of potential habitat will be removed as a result of the Modification.

14.1 TSC Act Significance assessment

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

Habitat likely to be affected by the proposed Modification provides foraging, roosting and breeding resources. It is unlikely that removal of 7.5 ha of potential habitat, representing only a small fraction of available habitat, would have a significant impact upon the lifecycle of the species in the locality, however it adds to the cumulative loss of habitat for this species within the locality.

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

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

Superb Parrot is a highly mobile, remnant habitat occurring outside the boundaries of the proposed Modification is likely to support local populations. It is unlikely that removal of 7.5 ha of potential habitat would have a significant impact upon the species, however it adds to the loss of habitat for this species.

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

The habitat within the project area is already fragmented. Removal of a total 7.5 ha of potential habitat across the Modification sites would not affect habitat connectivity to a level that would impact upon the conservation of the species.

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

Whilst the proposed Modification will result in a small incremental loss in habitat it is unlikely to significantly affect the long term survival of the Superb Parrot.

This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. Similar habitats would remain in the locality in the long term.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species due to its listing as a Vulnerable species. However despite not being on the register habitat within the proposed Modification is not considered to be critical.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

There is a national recovery plan for the Superb Parrot that outlines 4 broad recovery actions for the species. The proposed modification is unlikely to interfere with these recovery objectives owing to the small extent of potential habitat to be removed, the proposed Modification is not considered inconsistent with any identified priority action statements or recovery measures.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to the Superb Parrot the proposed Modification contribute to one key threatening process – clearing of native vegetation. As the proposed works will only make a minor contribution to this threatening process it is considered unlikely to significantly affect species.

Conclusion

7.5 ha of potential habitat will be removed by the proposed Modification. This is made up of the following vegetation communities identified in the proposed Modification area:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

It is unlikely that removal of 7.5 ha of grassy woodland would have a significant impact upon the species.

14.2 EPBC Act Significance Assessment

The Superb Parrot is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is this part of an important population?

This species has a breeding range occurring in three main areas, being; the Murray and Edwards Rivers; along the Murrumbidgee River; and an area bounded by Molong, Yass and Young (Department of Environment and Conservation 2006c). At least part of the population of the Superb Parrot undertakes regular seasonal movements, vacating breeding areas at the conclusion of the breeding season and heading north to the eucalypt-pine woodlands of central-west NSW (Department of Environment and Conservation 2006c) (Department of Environment Water Heritage & Arts 2009). While this species is dependent on flowering resources across a wide range of habitats (woodlands and forests) in its wintering grounds in NSW, the removal of 7.5 ha of potential habitat is not likely to disrupt their migratory pattern, which generally occurs 50 km to the west of the Project. As such, the Project is not likely to be a key source for breeding or dispersal.

The Superb Parrot is found throughout all regions of eastern inland NSW. The north of this species' range (for that part of the population which migrates annually) extends to around Wee Waa and Narrabri from a line joining Coonabarabran and Narrabri, and extends as far west as Quambone, with occasional records further west (Department of Environment and Conservation 2006c). Although the proposed Modification area essentially occurs outside the normal range of where this species migrates; any identified species potentially occurring within the proposed Modification area could be considered as occurring at the north-eastern limit of its distribution. However, with such a far ranging distributional limit in the northern wintering grounds, this species would not be at the distributional limit of its known distribution.

Potential occurrences of this species within the modification study area are not at the limits of the species' distribution and as such the site can only be considered to represent a part of the range of widely occurring individuals. For these reasons, if present within the site, individuals of this species would not be considered to be part of an important population.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

Lead to a long-term decrease in the size of an important population of a species

Not applicable, not part of an important population see above.

Reduce the area of occupancy of an important population of the species

Not applicable, not part of an important population see above.

Fragment an existing important population into two or more populations

Not applicable, not part of an important population see above.

Adversely affect habitat critical to the survival of a species

No critical habitat is listed for this species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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 (Department of Environment 2013).

The relatively small area of potential habitat likely to be affected by the Modification (7.5 ha) represents a relatively small component of locally occurring resources that would be accessible to this species. Therefore, the removal of about 7.5 ha of potential habitat would not be considered critical to the survival of this species.

Disrupt the breeding cycle of an important population

Not applicable, not part of an important population see above.

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

The Modification would remove approximately 7.5 ha of potential habitat for this species. It is not expected that the Modification will significantly modify, destroy, remove, isolate or decrease the availability or quality of habitat for the Superb Parrot to cause the species to decline. Approximately 7.5 ha of potential foraging habitat for this species would be affected by the Modification. This species has a breeding range occurring in three main areas, being; the Murray and Edwards Rivers; along the Murrumbidgee River; and an area bounded by Molong, Yass and Young (Department of Environment and Conservation 2006c). Therefore, no breeding habitat would be affected by the Project.

Vegetation occurring within the proposed Modification area could potentially be used by individuals of those populations of this species that migrate to the north of their range during winter. This species range extends north to around Wee Waa and Narrabri, from a line joining Coonabarabran and Narrabri, and extending as far west as Quambone, with occasional records further (Department of Environment Water Heritage & Arts 2009) (Department of Environment and Conservation 2006c). Although Leard State Forest essentially occurs outside the normal range of where this species migrates; the removal of approximately 21.9 ha of potential foraging habitat might reduce the area of occupancy of this species. However, given that this species was not recorded in the proposed Modification area or the BCEP Project Boundary, that the northern range of this species effectively occurs (approximately) 50 km to the north-east of Leard State Forest, and the fact that any local population of Superb Parrot would not be restricted to habitat resources in the proposed Modification area; it is considered that the Modification would not reduce the area of habitat for this species.

The Modification area is located within the locality and Boggabri Mine Biodiversity Offset properties which contain similar and higher quality habitat than that contained within the Modification area. This species is known to highly mobile in which to seek out preferable feeding resources and the Modification area would represent a small portion of this foraging area. The area of potential habitat likely to be affected (7.5 ha) represents a small component of locally occurring resources that would be accessible to this highly mobile species. Therefore, the removal of about 7.5 ha of potential habitat, is unlikely to cause the Superb Parrot to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat

The proposed Modification area currently exhibits disturbance regimes associated with agriculture, grazing and mining. These disturbances include vegetation clearing and habitat removal, artificial noise/light regimes and some weed invasion. It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Superb Parrot would become further established as a result of the Modification.

Introduce disease that may cause the species to decline

It is not likely that diseases that are potentially harmful to the Superb Parrot would become further established or introduced as a result of the Modification.

Will the action interfere with the recovery of the species?

The National Recovery plan for the Superb Parrot (Baker-Gabb 2011) has been approved and outlines that the long-term objective of recovery is to minimise the probability of extinction of the Superb Parrot in the wild, and to increase the probability of important populations becoming self-sustaining in the long term.

Specific objectives of recovery for the Superb Parrot (Baker-Gabb 2011) are to:

1. Determine population trends in the Superb Parrot.
2. Increase the level of knowledge of the Superb Parrot's ecological requirements.
3. Develop and implement threat abatement strategies
4. Increase community involvement in and awareness of the Superb Parrot recovery program.

Based on the potential ecological impacts of the Modification on this species, as discussed above, it is likely that the Modification would be in conflict with the third objective above as this objective has actions to retain potential habitat of River Red Gum and Box Gum Woodlands, by removing approximately 7.5 ha of potential habitat for the Superb Parrot. However, the habitat to be removed is relatively low quality with habitat compensatory programs including biodiversity offsetting involving habitat rehabilitation and conservation is being undertaken on Boggabri Mine Offset properties in the vicinity of the Modification.

Due to the largely low quality habitat likely to be affected by the Modification and the abundance of similar, and likely better quality habitat in the locality and greater region, the Modification is not likely to interfere with the recovery of the this species.

Conclusion

Although the Superb Parrot was not recorded in the proposed Modification area however within the proposed Modification area there is potential foraging resources for that part of the population that migrates north at the conclusion of the breeding season (winter). While the Modification would affect 7.5 ha and this would add to the remnant woodland, being removed as part of the BCEP Project, it is considered that the Modification would not reduce the area of occupancy of this species as the general area that this species occupies during migration, essentially occurs (approximately) 50 km to the west of the modification area. While vagrant records of this species may occur within the vicinity of the proposed Modification area, it is not likely that this species would be significantly affected by the Modification.

15. Turquoise Parrot (*Neophema pulchella*)

Status

The Turquoise Parrot is listed as Vulnerable under Schedule 2 of the TSC Act.

Distribution and habitat

Turquoise Parrots occur in the foothills of the Great Dividing Range in eucalypt woodlands and forests with a grassy or sparsely shrubby understorey, often in the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland (Department of Environment and Conservation 2006b). They nest in tree hollows, stumps or even fence posts, from August to December, laying four or five eggs on a nest of decayed wood dust. This species is usually seen in pairs or small, possibly family, groups and has also been reported in flocks of up to 30 individuals (Higgins 1999). The parrots spend most of the day on the ground and feed on seeds of both native and introduced grass and herb species. They forage quietly and may be quite tolerant of disturbance (Garnett & Crowley 2000).

Threats

This species is predominately threatened by degradation or loss of habitat, particularly the loss of hollow bearing trees (OEH 2012).

Specific impacts

This species was recorded during recent field surveys for the BCEP Project, in Grassy Woodlands on fertile soils, however was not recorded during survey for the proposed Modification. Within the proposed Modification area, potential habitat exists within the following vegetation communities:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

Approximately 7.5 ha of potential habitat would be modified as a result of the Modification.

15.1 TSC Act significance assessment

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

Habitat likely to be affected by the proposed Modification provides foraging, roosting and breeding resources. It is unlikely that removal of 7.5 ha of potential habitat, representing only a small fraction of available habitat, would have a significant impact upon the lifecycle of the species in the locality

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

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

Turquoise Parrot is commonly associated with disturbed areas and often favours the ecotone of forest edges and pasture or other grasslands (NSW Department of Environment and Climate Change 2009c). As this species is highly mobile, remnant habitat occurring outside the boundaries of the proposed Modification is likely to support local populations. It is unlikely that removal of 7.5 ha of potential habitat would have a significant impact upon the species.

(iv) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The habitat within the project area is already fragmented. Removal of a total 7.5 ha of potential habitat across the Modification sites would not affect habitat connectivity to a level that would impact upon the conservation of the species.

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

Whilst the proposed Modification will result in a small incremental loss in habitat it is unlikely to significantly affect the long term survival of the Turquoise Parrot.

This area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. Similar habitats would remain in the locality post-development.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species due to its listing as a Vulnerable species. However despite not being on the register habitat within the proposed Modification is not considered to be critical.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

There is neither a recovery nor threat abatement plan for the Turquoise Parrot. The Office of Environment and Heritage has however identified 10 management actions (see below). Owing to the small extent of potential habitat to be removed, the proposed Modification is not considered inconsistent with any identified management action statements.

- Identify three targeted populations (per year over initial three years); focus recovery actions and adaptive management at these sites.

- Identify sites where the species is commonly observed and target for incentives and habitat management.
- Encourage management of livestock grazing so as to improve understorey (foraging) habitat at priority sites.
- Select targeted areas where large populations occur and liaise with landholders to protect hollow-bearing trees.
- Control feral cats and foxes near high density populations (best practice: locally efficient and effective).
- Control feral goats and pigs of known or potential habitat.
- Control weeds at priority sites.
- Encourage bird observer groups to undertake spot monitoring surveys at previously recorded locations. Enter data collected into Wildlife Atlas.
- Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
- Develop an Expression of interest targeted towards private landowners to locate new sites and from this negotiate, develop and implement conservation management agreements for high priority sites.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to the Turquoise Parrot the proposed Modification contribute to one key threatening process – clearing of native vegetation. As the proposed works will only make a minor contribution to this threatening process it is considered unlikely to significantly affect species.

Conclusion

7.5 ha of potential habitat will be removed by the proposed Modification. This is made up of the following vegetation communities identified in the proposed Modification area:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests (Moderate condition).

It is unlikely that removal of 7.5 ha of habitat would have a significant impact upon the species.

16. Little Eagle (*Hieraaetus morphnoides*)

Status

The Little Eagle is listed as a Vulnerable species under the TSC Act.

Distribution, habitat and ecology

The Little Eagle is distributed throughout most of the Australian mainland, except in the most densely forested parts of the Great Dividing Range escarpment (NSW Scientific Committee 2009a), with adults being sedentary (to partly migratory in autumn-winter) and young being dispersive (Pizzey & Knight 2007). The Little Eagle occupies plains, foothills, open eucalypt forest and woodland or open woodland, while acacia woodlands and riparian woodlands of interior NSW are also used (Marchant and Higgins 1993). This species builds a large stick nest in tall living trees within remnant patches of vegetation and generally breeds from July to October (Pizzey & Knight 2007). The diet of the Little Eagle generally consists of terrestrial mammals, birds and reptiles (NSW Scientific Committee 2009a).

Threats

Over 50 % of forest and woodlands in NSW have been cleared (Lunney 2004), thus, the main threat that affects this species is the further clearing and degradation of foraging and breeding habitat (NSW Scientific Committee 2009a). On the NSW tablelands and western slopes, important habitat is 53 – 84 % cleared and moderately to highly stressed (NSW Scientific Committee 2009a). Loss of breeding sites may bring this species into increasing interspecific competition with the larger and more dominant Wedge-tailed Eagle.

Specific impacts

This species has been recorded during field studies for BCEP, soaring over the proposed Modification area and adjoining landscapes. As all the vegetation communities are considered potential habitat for the Little Eagle, The proposed Modification would require clearing of 69.2 ha of potential breeding and foraging habitat for this species.

16.1 TSC Act significance assessment

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

Approximately 69.2 ha of known and potential foraging and breeding habitat for Little Eagle would be affected by the proposed Project Boundary Modification.

The proposed Modification would not require the removal of hollow-bearing trees, which are a requirement for this species to build a nest – therefore not reducing potential breeding habitat. Also similar habitats will remain in the area. As it is a marginal disturbance, and considering the mobility of this species and the large home ranges occupied, it is considered unlikely that the proposed Modification would adversely affect the lifecycle of the species. However, it would add incrementally to the loss of foraging habitat.

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

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

69.2 ha of potential habitat would be removed representing a small reduction in habitat for the Little Eagle.

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

Remnant forest and woodland vegetation on private land adjacent to wooded areas along roads, tracks, creeks and paddock boundaries is essential to maintain connectivity across the landscape, to facilitate dispersal and to maintain foraging and breeding resources (NSW National Parks and Wildlife Service 2003). An area of 69.2 ha comprising nesting and foraging habitat, would be affected by the proposed Project Boundary Modification, thereby reducing the overall extent of known and potential habitat. Connectivity would not be affected any more than currently occurs in the locality.

Due to the large home range and mobility of this species, the ability to access adjacent habitat occurring outside the proposed Modification area would remain. Therefore, it is unlikely that individuals or a local population of this species would become fragmented or isolated from other areas of habitat. However, it would reduce the overall extent of known habitat and further exacerbate key threatening processes for this species.

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

Due to the small size of habitat to be disturbed (69.2 ha) and considering the remaining habitat within the locality and the wider region this area is not considered to represent core habitat for this species, although it is recognised that it provides nesting and foraging opportunities.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species due to its listing as a Vulnerable species. Regardless, the small area of habitat affected by the proposed Modification is not considered critical to the survival of this species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for the Little Eagle under the TSC Act. In the interim, the Office of Environment and Heritage have identified 3 management actions for the Little Eagle (refer to Table 16.1). The project is not likely to affect any of these management actions.

Table 16.1 Management actions for Little Eagle

Management actions for Little Eagle	Likely to be affected by the project
Raise awareness non-target poisoning from baits (Little Eagle).	No
Identify and secure appropriate habitat and improve management by erecting fences, adding supplementary planting, managing or reducing grazing, increasing size of habitat patches, planting stepping-stone linking patches and encourage the retention or placement of fallen logs, coarse woody debris and standing dead trees (Little Eagle).	No
Raise awareness of loss of habitat through population pressure and implement appropriate controls in areas subject to urban expansion, including identification of appropriate habitat and implementation of improved management (Little Eagle).	No

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The proposed Modification would involve a small amount of clearing of native vegetation, which is a known disturbance for this species.

Conclusion

The proposed Modification would impact upon 69.2 ha of known foraging habitat. While this reduction would add incrementally to the loss of foraging and breeding habitat in the locality, it is not likely to significantly affect this species, as a large continuous patch of remnant woodland would remain within the locality and the wider region of the proposed Modification.

17. Square-tailed Kite (*Lophoictinia isura*)

Status

The Square-tailed Kite (Debus *et al.* 1993)is listed as a Vulnerable species under the TSC Act (NSW National Parks and Wildlife Service 1999b).

Distribution, habitat and ecology

This raptor is endemic to Australia and is widespread throughout the mainland, although it is sparsely distributed (Marchant and Higgins 1993). The species is recorded along coastal and sub-coastal areas, from south-western to northern Australia, Queensland, NSW and Victoria. Scattered records throughout NSW indicate that the species is a regular resident along the major west-flowing river systems. This species is also migratory throughout its range and is a summer breeding migrant to south-eastern and south-western Australia. The Square-tailed Kite inhabits open forests, woodlands with particular preference for timbered watercourses. Within NSW, the species is often associated with ridge and gully forests containing *Eucalyptus longifolia* (Woollybutt), *C. maculata* (Spotted Gum) *E. elata* (River Peppermint) and *E. smithii* (Ironbark Peppermint), as well as forests containing Angophora and Callitris and Box-Ironbark woodland.

The Square-tailed Kite occupies large home ranges, in the order of 100 square kilometres, and is specialist hunter of passerines (particularly honeyeaters) and foliage insects, with most prey taken from the outer foliage of the tree canopy (NSW National Parks and Wildlife Service 1999b). Breeding occurs from July to February with an average clutch size of three eggs. Nest sites are generally located near watercourses in a fork or large horizontal branches of eucalypts or Angophora tree species.

Except when breeding, this species tends to be a solitary bird, usually seen hunting alone high in, or just above the tree canopy in coastal or sub-coastal rainforest, forest or woodland. Nests have been reported in Eucalyptus spp., Angophora spp. and native pine forests. Prey taken has included fledging birds, insects, rabbits and lizards.

Threats

Over 50 % of forest and woodlands in NSW have been cleared (Lunney 2004), thus, the main threat that affects this species is the further clearing and degradation of foraging and breeding habitat (NSW National Parks and Wildlife Service 1999b).

Specific impacts

This species has been anecdotally recorded in Leard State Forest (David Robertson 2009). Habitat exists within the Box Gum habitats of the proposed Modification area, including:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Derived native grassland
- Plains Grassland.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests.
- Exotic Grassland.

The proposed Modification would clear 69.2 ha of habitat for this species in addition to the habitat cleared for the BCEP project.

17.1 TSC Act significance assessment

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

The Square-tailed Kite has been anecdotally recorded in Leard State Forest (David Robertson 2009). Approximately 69.2 ha of potential foraging and breeding habitat for Square-tailed Kite would be affected by the proposed Modification.

Whilst the proposed Modification will reduce potential foraging and breeding opportunities for this species, remaining Leard State Forest would occur as a large continuous patch of remnant woodland adjacent. Therefore, it is likely to support nesting and foraging resources for this species. Moreover, given the mobility of this species and large home ranges occupied, this species would be able to access similar habitats in the locality with ease.

While the loss of potential habitat would add incrementally to the loss of foraging and breeding habitat, it is not likely to substantially affect the lifecycle of this species in the locality.

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

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Not applicable.

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

The Square-tailed Kite is known to occupy territories up to 100 square kilometres in eucalypt forest, woodland, open woodland and riparian woodland (NSW National Parks and Wildlife Service 1999a); therefore, it is estimated that less than 69.2 ha of habitat will be affected by the proposed Modification.

Habitat to be removed provides potential breeding and foraging resources for this species. However, the remaining large continuous patch of remnant woodland in the locality and the wider region is likely to provide greater nesting and foraging resources for this species.

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

Remnant forest and woodland vegetation is essential to maintain connectivity across the landscape, to facilitate dispersal and to maintain foraging and breeding resources (NSW National Parks and Wildlife

Service 2003). Whilst small areas of remnant vegetation, comprising potential breeding and foraging habitat, would be affected by the proposed Modification, connectivity would not be impacted any more than currently occurs in the locality. Due to the large home range and mobility of this species, the ability to access adjacent habitat occurring outside the proposed Modification would remain. Therefore, it is unlikely that individuals or a local population of this species would become fragmented or isolated from other areas of habitat.

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

In consideration of the potential habitat remaining in the locality, and the high mobility of the species, this area is not considered to represent core habitat for this species, although it is recognised that it may provide potential nesting and foraging opportunities. The small incremental loss in habitat it is unlikely to significantly affect the long term survival of the Square-tailed Kite.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species due to its listing as a Vulnerable species. The habitat in the proposed Modification area is not considered critical.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Neither a recovery nor threat abatement plan has been prepared for the Square-tailed Kite, however three management actions have been identified by Office of Environment and Heritage. The proposed Modification is unlikely to interfere with these actions, as no nest tree was identified.

Management actions for Square-tailed Kite:

- Ensure implementation of management strategies that reduce disturbance of riparian areas.
- Identify and protect nest trees, and monitor reproduction.
- Liaise with local field ornithologist to obtain data on the Square-tailed Kite in the area.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The proposed Modification would involve a small amount of clearing of native vegetation, which is a key threatening process.

Conclusion

The Square-tailed Kite has been anecdotally recorded in Leard State Forest. It is estimated that 69.2 ha of potential foraging habitat would be affected by the proposed Modification. While this reduction would add incrementally to the loss of foraging and breeding habitat in the locality, it is not likely to significantly affect this species, as a large, continuous patch of remnant woodland would surround the proposed Modification area, which is likely to provide foraging and nesting opportunities.

18. Barking Owl (*Ninox connivens*) and Masked Owl (*Tyto novaehollandiae*)

The Barking Owl and Masked Owl have been assessed together as they generally share similar habitat requirements; threats that affect their recovery; and potential impacts as result of the proposed Modification. Neither species were recorded during survey for the Modification within the proposed Modification area. All native communities are potential habitat for these species.

Barking Owl – *Ninox connivens*

The Barking Owl is listed as Vulnerable under Schedule 2 of the TSC Act. Barking Owls inhabit eucalypt woodland, open forest, swamp woodlands, and especially in inland areas, timber along watercourses (Pizzey & Knight 1997). Dense vegetation is used occasionally for roosting. During the day this species roosts along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in large Eucalypts (Higgins 1999).

Barking Owls feed on a variety of prey, with invertebrates predominant for most of the year, and birds and mammals, such as smaller gliders, possums, rodents and rabbits, becoming important during breeding. Estimates of Barking Owl home ranges indicated that territories range from 30 ha to 200 ha and hunt 5 km from roosts (Higgins 1999). However, surveys in the Pilliga forests of western NSW (Kavanagh, R. P. 2009) found that Barking Owl home ranges averaged approximately 2,000 ha. Regurgitated pellets also showed that prey items consisted of mostly birds, insects and some mammals.

Eggs are laid in nests in hollows of large, old eucalypts including River Red Gum (*Eucalyptus camaldulensis*), White Box (*Eucalyptus albens*), Red Box (*Eucalyptus polyanthemos*) and Blakely's Red Gum (*Eucalyptus blakelyi*). Nest-hollow entrances are 2 m to 35 m above the ground with a diameter of 20 cm to 46 cm and depth of 20 cm to 300 cm. Breeding occurs during late winter and early spring (NSW National Parks and Wildlife Service 2003).

Cluster analysis of records from NSW Wildlife Atlas within 300 km diameter around the Pilliga forests (Soderquist 2009) identified seven Barking Owl populations in the region of north-west NSW. The Pilliga population spreads to the Warrumbungle ranges and to the lower slopes of Mount Kaputar. While this population is an extensive one, no obvious lines of connectivity to other populations in the region were evident. Moreover, the gaps between these populations are generally wide expanses of mostly cleared habitat and without knowledge of juvenile dispersal ability, connectivity across the landscape cannot accurately be determined (Soderquist 2009).

Masked Owl – *Tyto novaehollandiae*

The Masked Owl is listed as Vulnerable under Schedule 2 of the TSC Act 1995. Masked Owls are distributed mainly throughout NSW from the coast where it is most abundant to the western plains (NSW Scientific Committee 2004), where they inhabit a diverse range of wooded habitats including eucalypt forests, woodlands and almost treeless inland plains. Optimal habitat includes an open understorey and a mosaic of sparse and dense ground cover. Large hollows in live or occasionally dead eucalypts are used for roosting (Department of Environment and Conservation 2006a) but are also known to roost and nest in dense foliage in gullies and caves (Garnett & Crowley 2000).

Masked Owls typically prey on terrestrial mammals including rodents and marsupials but would also take other species opportunistically. Territories range 400 ha to 1000 ha and forages by hunting from perches at ecotones within forests and at forest edges (Kavanagh, R. P. a. M. M. 1996).

Eggs are laid in nests in hollows of large, old eucalypts including River Red Gum (*Eucalyptus camaldulensis*), White Box (*Eucalyptus albens*) and Blakely's Red Gum (*Eucalyptus blakelyi*). Nest-hollow entrances are at least three metres above the ground with a diameter greater than 40 cm and depth greater

than 100 cm. Breeding mostly occurs during autumn and winter (NSW National Parks and Wildlife Service 2003).

Specific Impacts

The proposed Modification would remove 69.2 ha of potential habitat, in the form of the Woodlands within the proposed Modification area, including:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- Derived native grassland
- Plains Grassland.
- Weeping Myall Woodland.
- River Red Gum riparian woodlands and forests.
- Exotic Grassland.

Habitat likely to be affected provides foraging, roosting and breeding resources for these species.

18.1 TSC Act significance assessment

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

The habitat to be removed provides feeding resources for Barking Owls and Masked Owls in the form of birds, insects and some terrestrial mammals. Roosting and breeding resources in the proposed Modification area include dense clumps of canopy leaves in large Eucalypts for the Barking Owl and large hollows in Eucalypts for the Masked Owl. No hollow-bearing trees will be removed by the proposed Modification.

It is unlikely that the removal of 69.2 ha for the proposed Modification would significantly impact upon the lifecycle of the species.

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Not applicable

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

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

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

The proposed Modification would remove 69.2 ha of potential habitat in total. It is unlikely this would significantly impact upon the species. However, it contributes to the loss of known habitat for the BCEP project.

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

Much of the habitat within the proposed Modification area and locality is already fragmented. Removal of 69.2 ha of potential habitat for the species would not increase habitat fragmentation to a level that would impact upon the conservation of the species. Moreover, these species have large home ranges (up to 1000 ha for the Masked Owl and 2000 ha for the Barking Owl).

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

This area is not considered important for the long term survival of the species, as additional breeding and foraging habitat will remain in the locality, and 69.2 ha of habitat to be removed only represents a small fraction of the species range.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species. However, the potential habitat to be cleared is not considered to be critical to the survival of these species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A recovery plan has been prepared for Large Forest Owls (Department of Environment and Conservation 2005a), in which a number of recovery actions are listed (refer to Table 18.1). The plan covers the Powerful Owl, Masked Owl and Sooty Owl. The overall objective of the NSW Large Forest Owl Recovery Plan is to ensure that large forest owls persist in the wild in NSW in each region where they presently occur.

Table 18.1 Recovery actions for Large Forest Owls

Objective	Recovery action	Likely to be affected by project
Recovery action 1: To assess the Distribution and amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not, protected.	Update and refine existing owl habitat models using the best available information.	No
	Map the amount of modelled habitat across forested land in NSW.	No
	Design a sampling strategy to test the modelled habitat for the presence of owls and locate identified sites.	No
	Field validation of modelled habitat for the presence of owls.	No
	Estimate the areal amount of mapped modelled habitat for each owl species that is occupied (based on the proportion of sample sites with owls in them) and use this estimate to further estimate the number of owl territories present within different land tenures (based on home range data).	No
Recovery action 2: To monitor trends in population parameters (numbers, **Distribution**, territory fidelity and breeding success) across the range of the three species and across different land tenures and disturbance histories.	Develop a sampling methodology stratified across different land tenures and disturbance histories, as well as a set of standardised regional monitoring protocols.	No
	Seek cooperative involvement of other agencies, researchers and the community in the implementation of the regional monitoring program.	No
	Implement a regional monitoring program.	No
Recovery action 3: To assess the implementation and effectiveness of forest management prescriptions designed to mitigate the impact of timber-harvesting operations on the three owl species and, (if necessary), to use	Investigate the implementation by DPI (Forests NSW) of the forestry TSL owl prescriptions by carrying out proactive audits targeting these prescriptions (DEC) and through IFOA monitoring and reporting DPI (Forests NSW).	No

Objective	Recovery action	Likely to be affected by project
this information to refine the prescriptions so that forestry activities on state forests are not resulting in adverse changes in species abundance and breeding success.	Carry out post-harvest surveys in locations where owls were detected prior to logging to determine if they are continuing to occupy the habitat.	No
	Encourage student radio tracking projects examining the use of logged and unlogged forest by the three owl species.	No
	Make an assessment of the implementation and effectiveness of forestry owl prescriptions using data collected in this action.	No
	If necessary, refine the prescriptions and negotiate changes to the forestry TSLs.	No
Recovery action 4: Ensure the impacts on large forest owls and their habitats are adequately assessed during planning and environmental assessment processes	Prepare environmental impact assessment guidelines to assist consent and determining authorities and environmental consultants to assess impacts of developments on the large forest owls.	No
	Monitor and report on the effectiveness of concurrence and licence conditions that have previously been applied to reduce the impacts of developments on the three large forest owl species or their habitats. This will involve keeping a record of such conditions, selecting case studies and then checking for the presence of owls at long intervals post development.	No
	Use this information to develop a set of prescriptive guidelines that may be used to mitigate the impacts of developments on the three large forest owls.	No
	Provide up to date and accurate large forest owl and habitat information in the 'PVP Developer Threatened Species Tool', ensuring that broad-scale clearing is only approved under the NV Act if 'improve or maintain' test is met.	No
	Facilitate the adequate consideration of large forest owls during biodiversity certification of environmental planning instruments.	No
	Provide up to date information and data for the Bio Banking assessment methodology	No
Recovery action 5: Minimise further loss and fragmentation of habitat by protection and informed management of significant owl habitat (including protection of individual nest sites)	Prepare guidelines addressing issues associated with habitat protection and management, and survey assessment. Guidelines would provide detailed information on identification of significant owl habitat, appropriate strategies for its protection and for habitat creation as part of revegetation programs.	No
	Encourage CMAs to invest in actions that actively manage and/o or conserve large forest owl habitat and promote owl conservation on private lands.	No

Objective	Recovery action	Likely to be affected by project
	Encourage private landholders to undertake management options to conserve and/ or actively manage large forest owl habitat (and particularly nest sites) through incentive property management plans, voluntary conservation agreements and management incentives.	No
Recovery action 6: To improve the recovery and management of the three large forest owls based an improved understanding of key areas of their biology and ecology	Promote awareness and involvement of the research and management needs of the three large forest owls among scientific and academic community.	No
	Seek an Australian Research Council Linkage grant or other joint funding opportunity to initiate research into identified key areas of the biology and ecology of large forest owls.	No
	Seek scholarship funds for an aboriginal student to investigate the cultural and historic significance of the three species.	No
Recovery action 7: To raise awareness of the conservation requirements of the three large forest owls amongst the broader community, to involve the community in owl conservation efforts and in so doing increase the information base about owl habitats and biology.	Encourage and coordinate the involvement of community-based groups (e.g. the Australian Bird and Bat Study Association) and animal care groups (e.g. WIRES) in the implementation of recovery actions.	No
	Set up a website linked to the DEC internet site and targeted specifically at the community that will serve to provide information on owl identification (including photographs and samples of calls), habitat identification and protection, any current activities that they can be involved in as well as information on how and where to report sightings and other relevant information. Ensure this site has links to other key internet sites such as the Australasian Raptor Association.	No
Recovery action 8: To coordinate the implementation of the recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives	Coordination of implementation of actions.	No
	Review of plan and rewrite in final year.	No
	Convene a threatened owl workshop with relevant experts and stakeholders to reassess the State conservation Status of the three large forest owls. This action will be undertaken upon Conclusion of the implementation of all of the above actions.	No

The project is not likely to significantly affect any of these recovery actions regarding the Masked Owl.

Seventeen management actions have been developed by Office of Environment and Heritage; for the Barking Owl (as listed below). None of these management actions will be affected by the proposed modification.

- Assess the size, viability and status of the Barking Owl population in NSW using existing survey data and known information on distribution, preferred habitat, home range size and population density.
- Establish a program to monitor the NSW Barking Owl population and study its demographics, including the development, trial and establishment of a protocol for high-quality surveys to monitor the Barking Owl across land tenures and habitat types in NSW.

- Investigate conservation management strategies that act to manage known threats and restore habitat.
- Support biological and ecological studies e.g. preferred diet, reproductive strategies, home range, population viability.
- Support population genetics studies particularly between the eastern and south-western populations of Ninox connivens connivens and within the eastern population.
- Investigate the cultural and historic significance of the Barking Owl.
- Develop and distribute the Barking Owl information package. This will contain the species profile, environment assessment guidelines and prescriptions to minimise potential impacts.
- Prepare a poster and undertake a community survey and media campaign in rural and regional NSW to raise community awareness of the Barking Owl. The importance of each individual owl, and particularly breeding sites will be stressed.
- Establish formal conservation arrangements for properties with Barking Owls, which can be used to protect wildlife habitat.
- Negotiate with individual land managers to achieve appropriate measures to protect all known Barking Owl nest sites in NSW. Protection will need to address threats such as human disturbance, collision with wires, secondary poisoning from chemicals.
- Assess forestry prescriptions and Threatened Species Licences for their effectiveness in conserving the Barking Owl in State Forests.
- Incorporate the consideration of Barking Owl habitat and potential habitat as a high priority in the assessment of property for reserve establishment.
- Research is required into the effects of agricultural poisons upon the species.
- Maintain the threatened owl working group and links with owl researchers.
- Facilitate the establishment and maintenance of links with community involved in Barking Owl conservation.
- Coordinate the implementation of the recovery plan.
- Complete the final recovery plan for Barking Owls by 2006.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The proposed Modification would involve a small amount of clearing of native vegetation including the removal of hollow bearing trees, which are key threatening process that threaten these species.

Conclusion

Approximately 69.2 ha of potential habitat will be removed for the proposed Modification. It is unlikely that removal of this small amount of woodland would have a significant impact upon these species; however it contributes to the cumulative removal of known habitat within the locality.

19. Microchiropteran bats

Threatened species of microchiropteran bat have been assessed together as they generally share similar habitat requirements, threats that affect their recovery, and potential impacts as result of the proposed Project Boundary Modification. Microchiropteran bats considered for this impact assessment are:

Hollow-bearing microchiropteran bats:

- Greater Long-eared Bat – south eastern form (*Nyctophilus timoriensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*).

Cave dwelling microchiropteran bats:

- Eastern Cave Bat (*Vespadelus troughtoni*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Little Pied Bat (*Chalinolobus picatus*).

Greater Long-eared Bat

The Greater Long-eared Bat is listed as Vulnerable under the TSC Act 1995 and the EPBC Act 1999.

Greater Long-eared Bats inhabit a variety of vegetation types, including mallee and box eucalypt dominated communities, but they are distinctly more common in box/ironbark/cypress-pine vegetation, which occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. They roost in tree hollows, crevices and under loose bark. It is a slow flying, agile bat using the understorey to hunt non-flying prey — especially caterpillars and beetles — and will even hunt on the ground. Mating takes place in autumn, with one or two young born in late spring to early summer (Churchill 2008).

Although no individuals were recorded during current surveys, this species has previously been recorded in Leard State Forest (Pennay 2001), and suitable habitat exists within the proposed Modification area.

Eastern False Pipistrelle

The Eastern False Pipistrelle is listed as Vulnerable under the TSC Act 1995.

This species is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania (Department of Environment and Climate Change 2005; NSW Department of Environment and Climate Change 2009a). Its distribution extends over the Great Dividing Range, with a preference for wet altitude forests. This species is thought to hunt beetles and moths above, or just below the canopy. The Eastern False Pipistrelle roosts in tree hollows, although it can sometimes be found in caves (Jenolan area) and buildings (Churchill 1998). This species hibernates during winter, with females pregnant in late spring-early summer (NSW Department of Environment and Climate Change 2009a).

This species was recorded via Anabat during field surveys for the BCEP in 2010.

Yellow-bellied Sheathtail Bat

The Yellow-bellied Sheathtail Bat is listed as Vulnerable under the TSC Act 1995.This species has been frequently observed in the Box Gum woodlands within Leard State Forest. This species is wide ranging and found across northern and eastern Australia, encompassing the majority of NSW. Although, only scattered

records exist across the New England Tablelands and north-west slopes (NSW Department of Environment and Climate Change 2009d). This species occurs in eucalypt forest where it flies high above the canopy, feeding on insects. In mallee or open country it feeds closer to the ground. Generally a solitary species but sometimes found in colonies of up to 10. It roosts in tree hollows and is thought to be a migratory species to southern Australia during late summer and autumn (Churchill 1998). Little is known about this species' life cycle. Breeding has been recorded from December to late March in this species (NSW Department of Environment and Climate Change 2009d).

This species was recorded via Anabat during field surveys for the BCEP – more detail in the Continuation of Boggabri Coal Mine - Biodiversity Impact Assessment (Parsons Brinckerhoff 2010).

Eastern Cave Bat

The Eastern cave bat is listed as listed as Vulnerable under the TSC Act 1995.

A cave-dwelling species found in eastern Australia from Cape York to NSW. They inhabit tropical mixed woodland and wet sclerophyll forests on the coast and the dividing range, but extend into drier forests on the western slopes (Churchill 1998). Breeding habitat includes caves, rocky outcrops, cliffs, scarps and old mine workings. Roosting habitat includes breeding habitat types and very small crevices in rocky areas or boulder piles or old mine workings and Fairy martin nests. Foraging habitat includes suitable native vegetation within 5km of breeding habitat (Office of Environment and Heritage 2011b).

This species was not recorded within the Modification study area are however a maternity cave has been recorded within 5 km of the Modification study area which is considered likely to contain only marginal foraging habitat for the species.

Large-eared Pied Bat

The Large-eared Pied Bat is listed as Vulnerable under the TSC Act 1995 and EPBC Act 1999.

Occurs in moderately wooded habitats, mainly in areas with extensive cliffs and caves and roosts in caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins (Churchill 1998; Office of Environment and Heritage 2011b). Breeding habitat (maternity roosts) is located in roof domes in sandstone caves (Office of Environment and Heritage 2011b). Thought to forage below the forest canopy for small flying insects (Churchill 1998).

This species was not recorded within the Modification study area are however has potentially been recorded within the Project Boundary during previous surveys. The Modification study area is considered likely to contain only marginal foraging habitat for the species.

Little Pied Bat

The Little Pied Bat is listed as Vulnerable under the TSC Act 1995.

The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria and has been recorded in dry open forest, open woodland, Mulga woodlands, chenopod shrublands, Callitris forest and mallee (Churchill 1998; Office of Environment and Heritage 2011a). The species roosts and breeds in tree hollows, fissures or cracks, buildings, powerpoles, fenceposts, caves, cliff crevices, mine shafts and tunnels. Roost sites in caves are usually warm and dry but the species can tolerate roost temperatures of more than 40 degrees Celsius (Office of Environment and Heritage 2011a).

This species was not recorded within the Modification study area are however has potentially been previously recorded within the Project Boundary during previous surveys. The Modification study area is considered likely to contain only marginal foraging habitat for the species.

Threats (combined for all species)

- Loss or Modification of habitat (including feeding habitat) near roosting and maternity sites.
- Clearing and isolation of dry eucalypt forest and woodland, particularly about cliffs and other areas containing suitable roosting and maternity sites, mainly as a result of agricultural and residential development.
- Predation by cats.
- Application of pesticides in or adjacent to foraging areas may reduce the availability of invertebrates, or result in the accumulation of toxic residues in individuals' fat stores.
- Damage to roosting and maternity sites from mining operations.
- There is a strong likelihood that unrecorded populations could be unintentionally affected by land management actions.

Specific Impacts

The proposed Modification would remove 69.2 ha of potential foraging and roosting habitat (hollow-dependent species only), in the form of all vegetation communities identified within the proposed Modification area. Habitat likely to be affected provides foraging, roosting and breeding resources for these species.

19.1 TSC Act significance assessment

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

Field surveys identified that the proposed Modification area contains hollow-bearing trees but does not contain any cave like roost structures. During previous studies conducted for the BCEP four threatened species of microchiropteran bat, Eastern False Pipistrelle, Little Pied Bat, Large-eared Pied Bat (potentially) and Yellow-bellied Sheathtail Bat, were recorded via Anabat. Greater Long-eared Bat has previously been recorded in the area by NSW National Parks and Wildlife Service (Pennay 2001). In addition a maternity cave has been recorded within the vicinity which contains a populations of Eastern Cave Bat.

The proposed Modification will not require the removal of any hollow bearing trees but will require the removal of 69.2 ha of native vegetation, all of which is considered foraging habitat. As no hollow bearing trees will be removed as a result of the proposed Modification and that a large number of hollow bearing trees will remain in the locality the proposed Modification is unlikely to have a significant adverse effect on the lifecycle of this species as it is relatively small areas of potential breeding, foraging and commuting habitat being impacted.

Furthermore, as outlined in the Continuation of Boggabri Coal Mine - Biodiversity Impact Assessment (Parsons Brinckerhoff 2010) a large continuous patch of remnant woodland, with a similar or greater density of hollow-bearing trees, would remain in the area surrounding the proposed Modification area providing important habitat resources for foraging, roosting and breeding.

The cumulative effect of the proposed Modification and the BCEP may affect the local population. However the Modification alone is not considered likely to have a significant impact on these species.

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

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

69.2 ha of native vegetation representing suitable foraging habitat for this species is likely to be affected by the proposed Modification. This is a relatively small area of potential foraging and roosting habitat being impacted

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

The proposed Modification is unlikely to represent significant habitat isolation and/or fragmentation given the small incremental increase of disturbance of potential habitat (69.2 ha) and the mobility of the species.

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

The proposed Modification would remove 69.2 ha of moderate to good value habitat that provides foraging resources. Increasing the total area affected by the BCEP and associated works.

The area of habitat proposed to be removed for the BCEP alone was considered to be of importance to the long-term survival of Microchiropteran Bats in the locality. The further disturbance caused by the proposed Modification would further reduce the area of occupancy for these species.

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

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act 1995, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species due to their Vulnerable species listing. The habitat which would be affected by the proposed Modification is not considered critical to the survival of the species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery or threat abatement plans have been prepared for any of the Microchiropteran bats. The Office of Environment and Heritage has however identified measures that need to be implemented to recover these species.

The proposed development is not likely to significantly adversely affect any of these recovery actions with the possible except of vegetation removal around possible marginal (non-breeding) roost sites (i.e. small fissures in trees). This impact is unlikely to significantly affect the recovery of any local population of the species.

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

The action proposed constitutes the following key threatening processes, as listed under the TSC Act 1995:

- clearing of native vegetation

Considering the cumulative impact the BCEP and proposed Modification, these key threatening processes could negatively impact the Microchiropteran Bats. However, the proposed Modification would only affect a marginal area of suitable habitat in relation to the availability to these habitats in the broader locality.

Threat abatement plans have not been prepared for these processes.

Conclusion

Field surveys identified numerous hollow bearing trees within the proposed Modification area however no caves were recorded. During previous studies, conducted for the Continuation of Boggabri Coal Mine - Biodiversity Impact Assessment (Parsons Brinckerhoff 2010), four threatened species of microchiropteran bat, Eastern False Pipistrelle, Little Pied Bat, Large-eared Pied Bat (potentially) and Yellow-bellied Sheathtail Bat, were recorded via Anabat. Greater Long-eared Bat has previously been recorded in the area by NSW National Parks and Wildlife Service (Pennay 2001). In addition a maternity cave for the Eastern Cave Bat has been recorded within the locality (approximately 5 km from Modification study area).

In addition to the habitat being affected by the BCEP, 69.2 ha of moderate to good habitat would be removed. Therefore, whilst it is considered that the proposed Modification would reduce the area of occupancy and add incrementally to processes that threaten these species, it is unlikely to be a significant impact upon these species.

19.2 EPBC Act significance assessment – Greater Long-eared Bat & Large-eared Pied Bat

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will result in one or more of the following.

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

The proposed Modification would remove 69.2 ha of habitat for these species, including potential foraging resources. However, this species is highly mobile (known to forage more than three kilometres from roost sites) (Churchill 1998), and similar foraging and roosting resources would remain in the locality.

Will the action reduce the area of occupancy of an important population of the species?

A local population of Greater Long-eared Bat and Large-eared Pied Bat would not be restricted to habitat resources in the proposed Modification area. A relatively small patch (69.2 ha) of potential foraging and roosting habitat for this species would be affected by the proposed Modification. As similar habitat resources will remain in the surrounding landscape the proposed Modification is not considered likely to reduce the area of occupancy of an important population of Greater Long-eared Bat or the Large-eared Pied Bat.

Will the action fragment an existing important population into two or more populations?

Habitat connectivity would be unlikely to be significantly affected by the proposed Modification. Given the mobility of the Greater Long-eared Bat and Large-eared Pied Bat and the similar habitats in the locality it is unlikely that the proposed Modification would isolate the habitat fragment an existing population into two or more populations.

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

No critical habitat is listed for this species under the EPBC Act 1999.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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 (Department of Environment, 2013).

The proposed Modification would remove approximately 69.2 ha of potential foraging and breeding habitat for this species. However, this species high mobility would allow it to access and occupy foraging and roosting/breeding resources outside the proposed Modification area. Furthermore a large stand of continuous remnant woodland would remain around the area. Therefore, habitat within the subject site is not considered critical to the survival of the species.

Will the action disrupt the breeding cycle of an important population?

Any potential population of this species occurring within the proposed Modification area is not considered an important population. While the proposed Modification might disrupt the dynamics of a potential population, similar breeding resources would remain in the large stand of continuous remnant woodland in the locality.

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

The proposed Modification would decrease the availability of suitable habitat by 69.2 ha. However, important habitat resources such as tree hollows have similar densities inside and outside the proposed Modification area (Parsons Brinckerhoff 2010). Furthermore, the proposed Modification is not likely to increase the degree of fragmentation or isolation of this species. Thus, it is considered unlikely that the decrease in available habitat would cause the species to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is not likely that invasive species (such as introduced predators) that are harmful to the Greater Long-eared Bat or the Large-eared Pied Bat would become further established as a result of the proposed Modification.

Will the action introduce disease that may cause the species to decline?

No. There are no known diseases that are likely to increase in the area as a result of the proposed Modification.

Will the action interfere with the recovery of the species?

The Action Plan for Australian Bats (Duncan *et al.* 1999) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific roosting requirements.

Based on the potential ecological impacts of the proposed Modification on the Greater Long-eared Bat and Large-eared Pied Bat, as discussed above, it is not likely that the activities would interfere with the recovery of this species.

Conclusion

Populations of Greater Long-eared Bat and Large-eared Pied Bats potentially occurring in the proposed Modification area are not considered to be critical to the survival of the species. Based on the above assessment, this species is not likely to be significantly affected by the 69.2 ha of potential habitat to be removed for the proposed Modification.

20. Squirrel Glider (*Petaurus norfolcensis*)

Status

The Squirrel Glider is listed as Vulnerable under TSC Act 1995.

Distribution, habitat and ecology

Squirrel Gliders inhabit mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. Suitable vegetation communities include at least one species of plant that flowers heavily in winter and one or more of the smooth-barked eucalypts (Department of Environment and Conservation 2005b)

Tree hollows greater than five centimetres diameter, in both living and dead trees as well as hollow stumps, are used as den sites for refuge and nesting (Gibbons & Lindenmayer 2000). Studies in Queensland showed that Squirrel Gliders used ironbark eucalypts and stags more than the hollows of smooth barked eucalypts and non-eucalypt tree species (Rowston 1998).

Squirrel Gliders use tree hollows for diurnal shelter either alone or in family groups of up to six individuals and offspring that occupy the same hollow simultaneously. The size and composition of groups of gliders occupying a particular hollow varies from day to day because gliders regularly swap den trees (van der Ree 2002). The nests are bowl-shaped and lined with leaves within tree hollows (Triggs 1996).

Squirrel Gliders are nocturnal and display seasonal trends in feeding behaviour that are in accordance with phenological patterns consists of trees and shrubs (Goldingay & Sharpe 1998). Their diet includes acacia gum, eucalypt sap, nectar, honeydew and manna, lichens with invertebrates and pollen providing protein (NSW National Parks and Wildlife Service 1999b).

Squirrel Gliders are agile climbers and can glide for more than 50 metres in one movement. Nightly movements are estimated at between 300 metres and 500 metres. Home-ranges have been estimated as between 0.65 hectares and 8.55 hectares and movements tend to be greater for males than females. The home-range of a family group is likely to vary according to habitat quality and availability of resources, with more productive forests attributed to smaller home ranges (Quin 1995).

Specific impacts

This species was not recorded during the field survey however, this species is considered with a moderate or higher likelihood to utilise the Woodland habitats within the proposed Modification area, due to the presence of numerous habitat trees which provide suitable tree hollows and foraging resources. A total of 7.4 ha of potential habitat will be removed as a result of the Modification. No hollow-bearing trees will be removed. This is made up of all the Woodland habitats in the proposed Modification area, including:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- River Red Gum riparian woodlands and forests.

The removal of 7.4 ha of potential habitat will reduce the potential habitat and roosting opportunities for this species within the locality. However, a large tract of continuous bushland will remain in addition to many hollow bearing trees adjacent to the Modification sites.

20.1 TSC Act significance assessment

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

Boggabri Coal currently operates on the southern edge of Leard State Forest, which occurs as a >8,000 hectare remnant stand of vegetation, surround by an agricultural landscape between the Nandewar Range to the east, and the Pilliga Scrub to the west. The proposed Modification will impact up on 7.4 ha of potential foraging and breeding resources.

If present within the proposed Modification area, this species is likely to persist in similar habitats outside the proposed Modification area. This species regularly swap den sites, occupy territories between 0.65 hectares and 8.55 hectares, and have nightly movements ranging from 300 metres to 500 metres.

It is considered unlikely that the species lifecycle will be affected by the proposed Modification itself; however it will add incrementally to the impact to this species. The proposed modification is unlikely to have a significant impact upon this species due to the small area of removal.

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

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

7.4 ha of potential foraging and breeding habitat for this species would be affected by the proposed Modification. While this species was not recorded in the proposed Modification area during the field survey, potential habitat resources have been identified in the area.

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

Remnant forest and woodland vegetation on private land adjacent to wooded areas along roads, tracks, creeks and paddock boundaries is essential to maintain connectivity across the landscape, to facilitate dispersal and to maintain foraging and breeding resources (NSW National Parks and Wildlife Service 2003).

Whilst 7.4 ha of potential habitat would be affected by the proposed Modification, thereby reducing the overall extent of potential habitat, connectivity would not be significantly impacted any more than currently occurs in the locality

Due to the relatively large home range and mobility of this species, this potential loss of habitat is unlikely to result in isolation of habitat any more than currently occur within the locality. The ability to access adjacent habitat, occurring in the surrounding landscape, outside the proposed Modification area will remain. Therefore, it is unlikely that any local population of Squirrel Glider would become fragmented or isolated from other areas of habitat any more than currently occurs within the proposed Modification area. However, the proposed Modification would reduce the overall extent of potential habitat and further exacerbate key threatening processes affecting this species.

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

The importance of habitat to be removed by the proposed Modification, in terms of the long-term survival of the Squirrel Glider, is not considered to be high. It will reduce the over-all occupancy area for the species and potentially affect a minor amount of important foraging resources.

Whilst the Modification alone is not considered a significant impact to the species, the cumulative impacts of the BCEP are considered to be important to the long-term survival of the Squirrel Glider in the locality.

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

The Office of Environment and Heritage maintains a register of critical habitat. Land within the proposed Modification area is not listed or considered as critical habitat.

Habitat being removed for the associated BCEP is considered to be 'core habitat'' for this species, as Leard State Forest effectively occurs as an island of remnant vegetation surrounded by a cleared landscape.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Neither a recovery nor threat abatement plan has been prepared for this species. The Office of Environment and Heritage has identified the Squirrel Glider as a Landscape Species as part of the Saving Our Species program. In regard to the Squirrel Glider nine Management actions have been identified for this species (refer Table 20.1).

Table 20.1 Management actions for Squirrel Glider

Management action	Likely to be affected by the project
Conduct surveys on the Far South Coast, from Murramarong National Park south to Eden, to determine population size and extent and connectivity of populations (surveys should incorporate potential habitat on public as well as private land).	No
Model and predict the distribution of Squirrel Gliders across the south west slopes.	No
Delineate boundaries of population to identify the extent to which populations are interconnected (to determine propensity to move across cleared land).	No
Ensure the largest hollow bearing trees (including dead trees) are given highest priority for retention in PVP assessments and other environmental planning instruments, or other land assessment tools.	No
Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity. Give priority to largest hollow bearing trees.	No
Investigate the effectiveness of logging prescriptions.	No

Management action	Likely to be affected by the project
Prepare a recovery plan for the Squirrel Glider.	No
Conduct surveys and assessments of less known sites to confirm presence of species and negotiate, develop and implement conservation management agreements for high priority sites.	No
Control feral horses at relevant sites to promote retention and growth of mid-storey shrubs.	No

The project is not likely to affect any of these management actions.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to the Squirrel Glider, the proposed Modification contributes to one key threatening process - clearing of native vegetation. As the proposed works will only make a minor contribution to this threatening process it is considered unlikely to significantly affect species.

Conclusion

No squirrel gliders have been recorded within the proposed Modification area. However potential habitat resources were identified in the form of hollow bearing trees and foraging trees with in the vegetation communities within the proposed Modification area, including:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- River Red Gum riparian woodlands and forests.

It is assumed that 7.4 ha of potential habitat for the Squirrel Glider would be affected by the proposed Modification, which will increase the total area, impacted upon by BCEP and associated works. Given the species high mobility and ability to access adjacent remnant woodland in the locality and region, it is not likely that this species would be significantly affected by the proposed Modification itself – but it is considered to be affected by the cumulative impact of the proposed Modification and the BCEP.

21. Koala (*Phascolarctos cinereus*)

Status

The Koala is listed as Vulnerable under the TSC Act 1995 and Vulnerable for the combined populations of Queensland, New South Wales and the Australian Capital Territory under the EPBC Act 1999.

Description

The Koala is an arboreal marsupial with fur ranging from grey to brown above, and is white below. It has large furry ears, a prominent black nose and no tail. It spends most of its time in trees and has long, sharp claws, adapted for climbing. Adult males weigh 6 - 12 kilograms and adult females weigh 5 to 8 kilograms (NSW National Parks and Wildlife Service 2002a).

Distribution, habitat and ecology

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales it mainly occurs on the central and north coasts with some populations in the western region. It was historically abundant on the south coast of New South Wales, but now occurs in sparse and possibly disjunct populations (NSW National Parks and Wildlife Service 2003a).

Koalas are found in areas where there are suitable feed trees, ranging from open eucalypt woodlands to dense forests. Like other folivores, this species tends to be associated with forests growing on high-nutrient soils along river flats and drainage lines, most of which have been cleared for farmland (NSW National Parks and Wildlife Service 1999b). The suitability of forest and woodland communities as habitat for Koalas is influenced by the size and species of trees present, soil nutrients, climate, rainfall and the size and disturbance history of the habitat patches. Koalas feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species (Moore and Foley 2000).

Koalas are generally inactive for most of the day, feeding and moving mostly at night. They spend most of their time in trees, but will descend and traverse open ground to move between trees. They are generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size (Lunney et al. 2000).

Females reach sexual maturity at approximately two years and can produce one offspring each year, generally in summer (Ellis et al. 2000). Following birth, the young lives in the pouch for 6 months and on leaving the pouch it remains dependent on its mother, riding on her back. Dispersal distances of young generally range from 1 11 kilometres, although movements in excess of 50 kilometres have been recorded (NSW National Parks and Wildlife Service 2003a).

In coastal northern New South Wales, populations have been estimated to range from one animal every 45 hectares to one every 4.5 hectares (average one every 20-25 hectares) (Melzer *et al.* 2000). Most young disperse at two to three years of age and females remain in their natal area. If no suitable habitat is found by young individuals then they become nomadic (Lunney *et al.* 2000).

Threats

Specific threats identified in the Koala Draft Recovery Plan (NSW National Parks and Wildlife Service 2003a) include:

- destruction of habitat by clearing for urban development, agriculture and mining, particularly on high nutrient content soils

- fragmentation of habitat by roads, urban development and agriculture, which creates barriers to movement, isolates individuals and populations, alters population dynamics and prevents gene flow and the ability to maintain recruitment levels
- mortality from attacks by dogs, road fatalities, fires, drought or other natural disasters, particularly in fragmented landscapes without suitable refuge areas
- degradation of habitat by fire, weed invasion, removal of important habitat trees and climate change
- in stressed populations, infection by Chlamydia, causing cystitis, kerato conjunctivitis, infertility and other symptoms.

Specific impacts

One Koala was recorded during the nocturnal spotlight field surveys for BCEP in 2010, in the area immediately adjoining the proposed Modification area. Potential habitat for Koalas exists in all the woodlands within the proposed Modification area, including:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- River Red Gum Riparian Woodland and Forest.

In total, 7.5 ha of potential habitat would be disturbed as a result of the proposed Modification.

21.1 TSC Act significance assessment

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

No Koalas were observed during field surveys for the Modification, however habitat for this species was identified within the proposed Modification area. The low numbers of Koala recorded during field surveys for the BCEP in 2010 and lack of breeding females suggests that the areas proposed for the activities would not be considered core Koala habitat. The proposed Modification would disturb a small area of 7.5 ha of habitat for the Koala. Koala habitat will be retained in adjacent areas, continuing to provide Koalas with sufficient foraging and breeding resources.

As such, it is unlikely that the removal of marginal foraging habitat would disrupt the local population of Koala and place it risk of extinction.

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

Two populations of Koala are currently listed as Endangered under Part 2 of Schedule 1 of the TSC Act (Hawks Nest and Tea Gardens area population and the Pittwater Local Government Area population). The proposed Modification area is outside the occurrence of these populations.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

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

The amount of marginal foraging habitat (which includes sparsely distributed feed trees) proposed for removal is considered to be relatively small. The habitat proposed for disturbance (approximately 7.5 ha) is insignificant in relation to the amount of undisturbed good quality habitat that will remain within the wider locality.

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

The home range of Koala varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size (Lunney *et al.* 2000). The feed trees proposed for removal occur in the isolated patches of Poplar Box Grassy Woodland, River Red Gum located throughout the survey site and all the White box woodlands. Koala habitat will remain in the locality and the nature of clearing will not fragment habitat significantly.

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

The survey area provides a relatively small amount of suitable foraging habitat for Koalas. Foraging opportunities occurring in the proposed Modification area (i.e. *Eucalyptus populnea* subsp.. *bimbil* and *E. pilligarensis* trees), will be retained within the wider locality. The proposed Modification would not impact habitat considered critical to the long-term survival of populations in the locality and is unlikely to further create a barrier to movement for the species.

The quality and importance of habitat proposed for removal is not considered to be significant for the local Koala population.

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

The Office of Environment and Heritage maintains a register of critical habitat. No critical habitat has been listed for this species to date. The land within the proposed Modification area is highly fragmented with weed incursions and contains only a moderate diversity of native understory species. This land does not contain significant foraging habitat for Koala. As such this area is unlikely to be critical to the survival of the species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A recovery plan has been prepared for the Koala (Department of Environment and Climate Change 2008c) and aims to:

- reverse the decline of the Koala in NSW
- ensure adequate protection, management and restoration of Koala habitat
- maintain healthy and breeding populations of Koalas are present throughout their current range (NSW National Parks and Wildlife Service 2003a).

Specific objectives of the plan are to:

- conserve Koalas in their existing habitat
- rehabilitate and restore Koala habitat and populations
- develop a better understanding of the conservation biology of Koalas
- ensure that the community has access to factual information about the distribution, conservation and management of Koalas at a national, state and local scale
- manage captive, sick or injured Koalas and orphaned wild Koalas to ensure consistent and high standards of care
- manage over-browsing to prevent both Koala starvation and ecosystem damage in discrete patches of habitat.

Although the proposed Modification would include disturb a small area of fragmented habitat (6.5 ha) this is unlikely to affect the conservation of Koalas within the proposed Modification area or interfere with any of the other objectives of the draft recovery plan.

The proposed Modification would not interfere with the objectives or recovery actions proposed in the plan.

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

Key Threatening Processes are listed in Schedule 3 of the TSC Act 1995. The Koala is subject to a number of key threatening processes as well as other threats (Table 21.1).

The proposed Modification would include clearing of native vegetation which is listed as a Key Threatening Process under the TSC Act 1995. However, the native vegetation to be affected is minimal and would include only a few individual *Eucalyptus populnea* subsp. *bimbil* a preferred feed tree, in several isolated patches Poplar Box Grassy Woodland. The proposed Modification would be unlikely to result in the increase in any other recognised threat for this species.

Table 21.1 Recognised threats for Koalas

Threat to species	Key Threatening Process	Threat likely to increase as a result of the proposed Modification
Clearing of Native Vegetation	Yes	Yes
Predation by European Red Fox	Yes	No
Fragmentation of habitat through clearing for agriculture and development in coastal areas	No	No
Mortality from attacks by dogs, road fatalities, fires, drought or other natural disasters, particularly in fragmented landscapes without suitable refuge areas	No	No
Increase in weed invasion	Invasion by vines and scramblers is listed Invasion by *Lantana camara* has a preliminary listing	No
Stressed populations, infection by Chlamydia, causing cystitis, keratoconjunctivitis, infertility and other symptoms	No	No
Ecological consequences of high frequency fires	Yes	No
Degradation of habitat and removal of important	No	No. No tree clearing will be

Threat to species	Key Threatening Process	Threat likely to increase as a result of the proposed Modification
habitat trees		required.
Human caused climate change	Yes	No

Conclusion

No Koalas were recorded during field surveys for the proposed Modification however habitat in the form of feed trees (*E. poplulnea* subsp. *bimbil* and *E. pilligaensis*) were identified therein. One Koala was recorded during field surveys for the associated BCEP in 2010.

The proposed Modification requires the disturbance of 7.5 ha of woodland containing feed trees likely to be utilised by Koalas. Vegetation to be removed is not considered to be of great significance to the species, due to the abundance of retained habitat of similar or higher quality elsewhere in the wider locality. Therefore, it is considered unlikely that the proposed works will have a significant adverse effect on the species.

21.2 EPBC Act significance assessment

The Koala is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is this part of an important population?

The Koala occurs along the east coast of Australia and extends into Woodland, Mulga and River Red Gum forests west of the Great Dividing Range (Department of Environment and Climate Change 2008a). The range of the Koala covers all such suitable areas of NSW.

What is of most importance to this species is the presence of feed tree species as listed in Schedule 2 of the NSW SEPP 44. The survey area contains three feed tree species *E. Camaldulensis, E. poplulnea* subsp. *bimbil* and *E. pilligaensis.* These feed tree species also occur in abundance within the locality and greater region further afield. Although the site does provide potential foraging habitat due to the presence of feed tree species, similar suitable habitat occurs widely within the vicinity of the survey area and the wider locality. As a consequence, foraging habitat within the site is not considered critical to maintaining Koala populations.

Potential occurrences of this species within the survey area are not at the limits of the species' distribution and as such the site can only be considered to represent a part of the range of widely occurring individuals. For these reasons, if present within the site, individuals of this species would not be considered to be part of an important population.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

Lead to a long-term decrease in the size of an important population of a species

Not applicable, not part of an important population see above.

Reduce the area of occupancy of an important population of the species

Not applicable, not part of an important population see above.

Fragment an existing important population into two or more populations

Not applicable, not part of an important population see above.

Adversely affect habitat critical to the survival of a species

No critical habitat is listed for this species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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 (Department of Environment 2013).

The relatively small area of potential habitat likely to be affected by the Modification (7.5 ha) represents a relatively small component of locally occurring resources that would be accessible to this species. Therefore, the disturbance of about 7.5 ha of potential habitat would not be considered critical to the survival of this species.

Disrupt the breeding cycle of an important population

Not applicable, not part of an important population see above.

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

The Modification would disturb approximately 7.5 ha of potential habitat for this species. It is not expected that the Modification will significantly modify, destroy, remove, isolate or decrease the availability or quality of habitat for the Koala to cause the species to decline. The Modification area is located within the locality and Boggabri Mine Biodiversity Offset properties which contain similar and higher quality habitat than that contained within the Modification area. This species is known to highly mobile in which to seek out preferable feeding resources and the Modification area would represent a small portion of this foraging area. The area of potential habitat likely to be affected (7.5 ha) represents a small component of locally occurring resources that would be accessible to this highly mobile species. Therefore, the removal of about 7.5 ha of potential habitat, is unlikely to cause the Koala to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Koala would become further established as a result of the Modification.

Introduce disease that may cause the species to decline

It is not likely that diseases that are potentially harmful to the Koala would become further established or introduced as a result of the Modification.

Will the action interfere with the recovery of the species?

The NSW Recovery plan for the Koala (Garnett & Crowley 2000) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific breeding requirements.

Specific objectives of the Koala recovery plan (Menkhorst *et al.* 1999) include:

1. conserving koalas in their existing environment;
2. rehabilitating and restoring koala habitat and populations;
3. developing a better understanding of the conservation biology of koalas;
4. ensuring the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale;

5. managing captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care;

6. managing overbrowsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat; and

7. coordinating, promoting of implementation, and monitoring of the effectiveness of the NSW Koala Recovery Strategy across NSW.

Based on the potential ecological impacts of the Modification on this species, as discussed above, it is likely that the Modification would be in conflict with the second objective above, by disturbing approximately 7.5 ha of potential habitat for the Koala. However, the habitat to be removed is relatively low quality with scattered feed tree species and habitat compensatory programs including biodiversity offsetting involving habitat rehabilitation and conservation is being undertaken on Boggabri Mine Offset properties in the vicinity of the Modification.

Due to the largely low quality habitat likely to be affected by the Modification and the abundance of similar, and likely better quality habitat in the locality and greater region, the Modification is not likely to interfere with the recovery of the this species.

Conclusion

No Koalas were recorded during field surveys for the proposed Modification however habitat in the form of feed trees (*E. camaldulensis, E. poplulnea* subsp. *bimbil* and *E. pilligaensis*) were identified therein. One Koala was recorded during field surveys for the associated BCEP in 2010.

The proposed Modification requires the removal of 7.5 ha of woodland containing feed trees likely to be utilised by Koalas. Vegetation to be removed is not considered to be of great significance to the species, due to the abundance of retained habitat of similar or higher quality elsewhere in the wider locality.

While the Modification would add incrementally to the loss of suitable habitat for this species, given that the Modification is associated with the existing Boggabri Mine complex, the Modification is not likely to further fragment or isolate potential habitat for these species. Therefore, the proposal is not likely to have a significantly adverse effect on the Koala.

22. Pale-headed Snake (*Hoplocephalus bitorquatus*)

Status

The Pale-headed Snake is listed as Vulnerable under the TSC Act.

Description

The Pale-Headed Snake is a medium-sized largely tree-dwelling snake to 90 cm long. It is a uniform light brown or grey above with a white or cream band on the nape, bordered by a narrow blackish bar which may be solid, or broken in the middle. The top of the head is grey, and may have a series of black spots, which are most prominent along the edge of the white nape. The lips may have black vertical bars. The belly is creamy grey sometimes with darker flecks (Office of Environment and Heritage 2011c).

Distribution/habitat

It has a patchy distribution from north-east Queensland to north-east NSW. In NSW it occurs from the coast to the western side of the Great Divide as far south as Tuggerah. The species is found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. It favours streamside areas, particularly in drier habitats. It is known to shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees (Office of Environment and Heritage 2011c).

Ecology

This snake eats a variety of vertebrates, particularly tree-dwelling species, including frogs, geckos, skinks and bats. Examination of museum specimens revealed that frogs were the most common prey item (77 per cent of 26 prey items). Pale-headed Snakes hunt out in the open at night: however during the day they may remain active within their shelter and ambush other creatures also taking refuge.

Mating behaviour has been observed mostly in captive individuals. Behaviour interpreted as courtship took place in both spring (October) and autumn (April), and actual mating in spring (September), summer (February) and autumn (March, May). In the wild, females with very large follicles have been found in mid-spring (October) and gravid females have been found in early summer (January). The species is live-bearing, and give birth to between 2 and 11 young measuring around 26-27 cm long.

Threats

Threats to the Pale-headed Snake include:

- clearing and fragmentation of habitat
- forestry practices which result in loss of old or dead trees
- too frequent burning for fuel reduction or grazing management which destroys old and dead trees and removes understorey vegetation
- illegal collection of snakes from the wild (Office of Environment and Heritage 2011b).

Recovery actions

A recovery plan has not been prepared for this species. However, the Office of Environment and Heritage has identified the following recovery measures:

- manage fire to protect old and dead trees and maintain understorey vegetation
- retain hollow-bearing trees as well as large, mature trees

- manage grazing to maintain understorey vegetation
- retain and protect stands of native vegetation, especially those with old and dead trees and along creek lines
- establish and protect forested wildlife corridors
- keep only captive-bred snakes in captivity and seek a reptile-keeper's licence from the DEC (Office of Environment and Heritage 2011c).

Specific impacts

No Pale-headed Snakes were recorded within the proposed Modification area. Potential habitat for the Pale-headed Snake exists in the riparian and woodland habitats within the proposed Modification area. These habitats include the following:

- Pilliga Box – Poplar Box White cypress pine grassy open forest.
- River Red Gum riparian woodlands and forests.

In total, 7.4 ha of potential habitat would be removed as a result of the proposed Modification.

22.1 TSC Act significance assessment

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

This species requires large hollow bearing trees to complete vital aspects of its lifecycle such as reproduction. No hollow bearing trees will be removed by the proposal. There are a number of trees within the area however these will not require removal. Given that these trees are located in small areas of native vegetation isolated by grazed paddocks, and elevated from riparian foraging habitat, they are less likely to be utilised by the species than those located in larger areas of habitat in the locality or trees located near streams.

Although the cumulative effect of the proposed Modification and the BCEP may affect the local population, given the relatively small amount of potential habitat to be removed, it is unlikely that local populations of this species would be placed at a greater risk of extinction by the modification alone.

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Not applicable

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

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

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

It is estimated that approximately 7.4 ha of suitable habitat would be affected by the proposal. Although hollow-bearing trees do occur within the area none will be removed.

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

Approximately 7.4 ha of potential habitat is likely to be disturbed in the study area, and whilst potential habitat would be affected by the proposed Modification, thereby reducing the overall extent of potential habitat, connectivity would not be significantly impacted any more than currently occurs in the locality.

It is considered unlikely that habitat would become further isolated or fragmented significantly beyond that currently existing within the study area.

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

The proposal will result in the removal of approximately 7.4 ha of potential habitat for the Pale-Headed Snake. Little increase in fragmentation is expected from the proposed modification in light of the fragmented landscape surrounding the study area. Some small increase to isolation of habitat patches will occur. However, no impacts to dispersal are predicted for this species.

The importance of the habitat to be removed by the proposal in terms of the long-term survival of the Pale-Headed Snake in the locality is likely to be low. The habitat on site is considered to be moderately suitable when compared to the habitat present in the broader locality. The area of potential habitat to be removed is unlikely to be of critical importance to the long-term survival of the Pale-Headed Snake as it is small in relation to the extent of available habitat that occurs in the locality.

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

No critical habitat has been listed for the Pale-headed Snake to date. It is estimated that approximately 21.9 ha of suitable habitat would be affected by the proposed Modification: Suitable habitat occurring in the Modification is not considered critical to the survival of these species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

There is no recovery plan for the Pale-headed Snake as produced under the TSC Act. The Office of Environment and Heritage has identified recovery measures of which two will be interfered with by the Project:

- retain hollow-bearing trees as well as large, mature trees
- retain and protect stands of native vegetation, especially those with old and dead trees and along creek lines (Office of Environment and Heritage 2011c).

The Office of Environment and Heritage has however; identified 13 management actions to help recover this species (refer Table 22.1). The proposal is not likely to adversely affect any of these management actions (refer Table 22.1).

Table 22.1 Management actions for the Pale-headed Snake

Management Actions for Pale-headed Snake	Likely to be affected by the proposal
Encourage the community (via incentives) to implement habitat rehabilitation and protection (especially of dead and mature trees).	No
Ensure the Threatened Species Hazard Reduction List is updated with the requirements of this species and that personnel undertaking burns are aware of its presence and fire sensitivity.	No
Develop EIA guidance for consent and determining authorities with regard to development and other activities.	No
Audit the success of and improve IFOA prescriptions.	No
Implement management strategies that reduce disturbance and recover riparian areas within the range of the species on the western slopes and plains.	No
Retain, rehabilitate or create corridors to reduce isolation between sub-populations.	No
Identify two targeted populations (per year over initial three years) and focus recovery actions there, applying adaptive management strategies to determine and ameliorate threats.	No
Conduct further research into the ecology and habitat requirements of the species in NSW.	No
Address the threat of illegal collection.	No
Develop management strategies for water flow regimes to sustain riparian habitat.	No
Review / include operational guidelines for Warrumbungles NP, Pilliga NR, Pilliga West, Kilarney and Merriwindi CCA's Reserve Fire Management Strategies to protect this species habitat from fire (add prescription if known).	No
Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigation measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).	No
Reserve Fire Management Strategy to include operational guidelines to protect this species from fire.	No

Owing to the small area of potential habitat for the Pale-Headed Snake to be removed and the extent of similar or greater quality habitat within the surrounding landscape, the proposed Modification is unlikely to interfere substantially with the recovery of the species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The action proposed constitutes the following key threatening processes, as listed under the TSC Act 1995:

- clearing of native vegetation

Considering the cumulative impact the BCEP and proposed Modification, these key threatening processes could negatively impact the Pale-headed Snake. However, the proposed Modification would only affect a small area of suitable habitat in relation to the availability to these habitats in the broader locality.

Threat abatement plans have not been prepared for these processes.

Conclusion

Taking into consideration the significant impact criteria outlined above, and based on the fact that the potential habitat that would be affected (7.4 ha) is only likely to make up a small proportion of the habitat in the locality, the proposed Modification is unlikely to result in a significant impact to the Pale-Headed Snake.

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Appendix F

BioBanking field data sheets

ID - 1066

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14 (1.)

Site ID: both sides of proforma — Q2 (2.)

Survey type: BB (3.)
Include quadrate size, search area, transect length etc.

Recorders: AC, DL, (TB), PR, JS, SH, AR (4.)

Stratification and patch ID: (5.)

Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure
Site 30 Nth

Photo number:

Location recorded with GPS # or Tablet: (7.) 1:100,000 MAP NAME: 30.62485 150.03995 (8.)

Unique Point ID #:	ZONE	EASTING	NORTHING
		0	
		0	

(9.)

GPS accuracy: ± metres (10.)

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes: (11.)

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground

Ground Cover %: (12.)

Bare soil	
Litter	
Timber	
Rock (type)	
Vegetation (type)	
Total 100%	

Vegetation community: (13.)

Mapped community: Pilliga Box - Poplar Box - White cypress pine grassy open forest.

Field Community:

Structure and composition ❖ : (14.)

Strata[!]:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:
Can	18-25 m	0-30 %.	Eucalyptus
Shrub	0.4-2 m	0-5 %.	~~Vac~~ Vachellia farnesiana
ground	0.1-1.8 m	50-90 %.	Austrostipa aristaglumis Circium vulgare Brassica Silybum marianum

❖ Community structure should be described as per Specht et al 1995
[!]: Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
* 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤ Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF | **VEGETATION SURVEY PROFORMA P2** | Site ID: Q2 | 2.

	Species	Presence	Strata		Species	Presence	Srtata
1	Eucalyptus	4		42			
2	Vachellia farnesiana	2		43			
3	Austrostipa aristaglumis	3		44			
4	Cirsium vulgare	2		45			
5	Brassica	3		46			
6	Silybum marianum	2		47			
7	Echium plantaganeum	3		48			
8	Eucalyptus blakelyi	1	?	49			
9	Einadia polygonoides	2		50			
10	Petronagia dubia	1		51			
11	Lolium perenne	4		52			
12	Aristida ramosa	1		53			
13	Sporobolus creber	1		54			
14	Daucus glochinoides	1		55			
15	Dichanthium sericeum	2		56			
16	Panicum queenslandicum	1		57			
17	Sclerophylla birchii	2		58			
18	Eragrostis leptostachya	1		59			
19	Leptaum africanum	1		60			
20	Centaurea calcitrapa	2		61			
21	Sonchus oleraceus	2		62			
22	Chloris truncata	1		63			
23	Echium vulgare	1		64			
24	Oxalis cornicularis	2		65			
25	Callotis lappulaceae	1		66			
26				67			
27				68			
28				69			
29				70			
30				71			
31				72			
32				73			
33				74			
34				75			
35				76			
36				77			
37				78			
38				79			
39				80			
40				81			
41				82			

Transect Number	Number of hits (tally)	%
Native over-storey cover (%)	0, 0, 0, 0, 0, 0, 0, 0, 0, 25, 30,	
Native mid-story cover (%)	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0	0
Native ground cover grasses (%)	𝍸 𝍸 𝍸 𝍸 ~~𝍸 𝍸~~ III	
Native ground cover shrubs (%)		
Native ground cover other (%)	II	
Exotic plant cover (%)	𝍸 𝍸 𝍸 𝍸 𝍸	

Larger 50 X 20 m Plot	
1. Length of Woody debris >10cm wide & > 0.5 m long	0
2. Proportion of canopy species regeneration	0
3. Number of trees with hollows > 5 cm	1

Cover abundance scale 1-7			1 - 6 scale conversion	
1	<5% - Rare or few individuals	3 or less individuals	1	sparse <5%
2	<5% - uncommon	more than 3 - sparsely scattered	1	sparse <5%
3	<5% - common	consistent throughout plot	2	any no. < 5%
4a	<5% very abundant	many individuals throughout plot	2	any no. < 5%
4b	5% - 25%		3	5 - 25%
5	25% - 50%		4	25 - 50%
6	50% - 75%		5	50 - 75%
7	75% - 100%		6	75 - 100%

ID - 1072

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14 (1.)

Site ID: both sides of proforma — Q8 (2.)

Survey type: BB (3.)
Include quadrate size, search area, transect length etc.

Recorders: AC, DL, TB, PR, JS, SH, AR (4.)

Stratification and patch ID: (5.)

Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure
Victoria Site 30

Photo number:

Location recorded with GPS # or Tablet: (7.) 1:100,000 MAP NAME: GPS 778 (8.)

Unique Point ID #	ZONE	EASTING	NORTHING	(9.)
		0		30.63324 150.12695.
		0		

GPS accuracy: ± metres (10.)

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes: (11.)

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground 80-90%

Ground Cover %: (12.)

Bare soil	20
Litter	0
Timber	0
Rock (type)	0
Vegetation (type)	80
Total 100%	100

Vegetation community: (13.)

Mapped community: –

Field Community: Exotic Grassland.

Structure and composition ❖ : (14.)

Strata!:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:
Can	–	–	–
Shrub	–	–	–
ground	0.1 - 0.6 m	40-90%	Lolium perenne. Centaurium calcitrapa Bothriola decepiens Sclerophylla birchii.

❖ Community structure should be described as per Specht et al 1995
! Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
* 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤ Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF | **VEGETATION SURVEY PROFORMA P2** | Site ID: Q8

Species	Presence	Strata	Species	Presence	Strata
1 Chloris truncata		1	42		
2 Sonchus olearevs.		3	43		
3 Trifolium arvensis		3	44		
4 Dichathium sericium		3	45		
5 Centavriea calcitrapa		5	46		
6 Bothriochloa decepiens		2	47		
7 Cgnodon dactylon		2	48		
8 Lolium perene		~~4~~ 5	49		
9 Sclerophylla birchilli		3	50		
10 Sida corrugata		1	51		
11 Daucus glochinoides		1	52		
12 Vittadinia cuneata		1	53		
13 Eragrostis leptostachya		2	54		
14			55		
15			56		
16			57		
17			58		
18			59		
19			60		
20			61		
21			62		
22			63		
23			64		
24			65		
25			66		
26			67		
27			68		
28			69		
29			70		
30			71		
31			72		
32			73		
33			74		
34			75		
35			76		
36			77		
37			78		
38			79		
39			80		
40			81		
41			82		

Transect Number	Number of hits (tally)	%
Native over-storey cover (%)	0 →	0
Native mid-story cover (%)	0 →	0
Native ground cover grasses (%)	卌 卌 卌	30
Native ground cover shrubs (%)	—	0
Native ground cover other (%)	—	0
Exotic plant cover (%)	卌 卌 卌 卌 卌 卌 |||| 34	68

BARE 1

Larger 50 X 20 m Plot	
1. Length of Woody debris >10cm wide & > 0.5 m long	0
2. Proportion of canopy species regeneration	0
3. Number of trees with hollows > 5 cm	0

Cover abundance scale 1-7			1 - 6 scale conversion	
1	<5% - Rare or few individuals	3 or less individuals	1	sparse <5%
2	<5% - uncommon	more than 3 - sparsely scattered	1	sparse <5%
3	<5% - common	consistent throughout plot	2	any no. < 5%
4a	<5% very abundant	many individuals throughout plot	2	any no. < 5%
4b	5% - 25%		3	5 - 25%
5	25% - 50%		4	25 - 50%
6	50% - 75%		5	50 - 75%
7	75% - 100%		6	75 - 100%

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14 (1.)

Site ID: both sides of proforma — Q9 (2.)

Survey type: BB (3.)
Include quadrate size, search area, transect length etc.

Recorders: AC, DL, (TB), PR, JS, SH, AR (4.)

Stratification and patch ID: (5.)

Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure
Victoria Site 30

Photo number:

Location recorded with GPS # or Tablet: (7.) 1:100,000 MAP NAME: GPS 779 (8.)

Unique Point ID #: ZONE EASTING NORTHING (9.)
30.63970
150.10851

	ZONE	EASTING	NORTHING
		0	
		0	

GPS accuracy: ± metres (10.)

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes:

(11.)

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground

(12.) Ground Cover %:

Bare soil	
Litter	
Timber	
Rock (type)	
Vegetation (type)	
Total 100%	

Vegetation community:

(13.)

Mapped community: —

Field Community: ~~Exotic Grassland~~ Derived Native Grassland (Piligar)

Structure and composition ❖ :

(14.)

Strata!:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:
Can	—	—	—
Shrub	—	—	—
ground			

❖ Community structure should be described as per Specht et al 1995
!: Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
*: 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤: Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF | **VEGETATION SURVEY PROFORMA P2** | Site ID: Q9 | 2.

Species	Presence	Strata	Species	Presence	Srtata
1 Rodanthe diffusa subsp leucactina	6		42		
2 Lolium perenne	4		43		
3 Sonchus olearus	2		44		
4 Trifolium sativa	3		45		
5 Trifolium arvensis	1		46		
6 Centaurea calcitrapa	3		47		
7 Austrostipa aristaglumis	3		48		
8 Aristida ramosa	~~3~~ 2		49		
9 Lepidium africanum	1		50		
10 Sclerophylla brachilli	2		51		
11 Chloris divercatum	3		52		
12			53		
13			54		
14			55		
15			56		
16			57		
17			58		
18			59		
19			60		
20			61		
21			62		
22			63		
23			64		
24			65		
25			66		
26			67		
27			68		
28			69		
29			70		
30			71		
31			72		
32			73		
33			74		
34			75		
35			76		
36			77		
37			78		
38			79		
39			80		
40			81		
41			82		

Transect Number	Number of hits (tally)		%
Native over-storey cover (%)	0 →		
Native mid-story cover (%)	0 →		
Native ground cover grasses (%)	II	2	4
Native ground cover shrubs (%)			0
Native ground cover other (%)	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 IIII	34	68
Exotic plant cover (%)	𝍸 𝍸𝍸 𝍸 𝍸 I	21	42

Larger 50 X 20 m Plot	
1. Length of Woody debris >10cm wide & > 0.5 m long	
2. Proportion of canopy species regeneration	
3. Number of trees with hollows > 5 cm	

Cover abundance scale 1-7			1 - 6 scale conversion	
1	<5% - Rare or few individuals	3 or less individuals	1	sparse <5%
2	<5% - uncommon	more than 3 - sparsely scattered	1	sparse <5%
3	<5% - common	consistent throughout plot	2	any no. < 5%
4a	<5% very abundant	many individuals throughout plot	2	any no. < 5%
4b	5% - 25%		3	5 - 25%
5	25% - 50%		4	25 - 50%
6	50% - 75%		5	50 - 75%
7	75% - 100%		6	75 - 100%

ID- 1074

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14 (1.)

Site ID: both sides of proforma: Q10 (2.)

Survey type: BB (3.)
Include quadrate size, search area, transect length etc.

Recorders: AC, DL, (TB) PR, JS, SH, AR (4.)

Stratification and patch ID: (5.)

Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure
Middle paddock Victoria

Photo number:

Location recorded with GPS # or Tablet: (7.) 1:100,000 MAP NAME: (8.) GPS 780

Unique Point ID #: (9.)

	ZONE	EASTING	NORTHING
		0	
		0	

30.65073
150.10316

GPS accuracy: ± metres (10.)

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes: (11.)

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground

Ground Cover %: (12.)

Bare soil	
Litter	
Timber	
Rock (type)	
Vegetation (type)	
Total 100%	

Vegetation community: (13.)

Mapped community:

Field Community: Exotic Grassland

Structure and composition ❖ : (14.)

Strata!:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:
Can	–	–	–
Shrub	–	–	–
Ground	0.1–0.4m	0–50 %	Centaurea calcitropa

❖ Community structure should be described as per Specht et al 1995
!: Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
* 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤ Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF | **VEGETATION SURVEY PROFORMA P2** | Site ID: Q10 | 2.

Species	Presence	Strata	Species	Presence	Srtata
1 Brassica rapa			42 3		
2 Trifolium arvensis			43 3		
3 Lolium perenne			44 4		
4 Bothriochloa decepiens			45 1		
5 Sporobolus caroli			46 1		
6 Chloris truncata			47 1		
7 Rhodanthe diffusa subsp leucactina			48 2		
8 Austrodanthonia			49 2		
9 Vittadinia cuneata			50 1		
10 Sclerophylla birchilli			51 2		
11 Centarria calcitropa			52 5		
12			53		
13			54		
14			55		
15			56		
16			57		
17			58		
18			59		
19			60		
20			61		
21			62		
22			63		
23			64		
24			65		
25			66		
26			67		
27			68		
28			69		
29			70		
30			71		
31			72		
32			73		
33			74		
34			75		
35			76		
36			77		
37			78		
38			79		
39			80		
40			81		
41			82		

Transect Number	Number of hits (tally)		%
Native over-storey cover (%)			0
Native mid-story cover (%)			0
Native ground cover grasses (%)	IIII	4	8
Native ground cover shrubs (%)			0
Native ground cover other (%)	II	2	4
Exotic plant cover (%)	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ IIII	44	88

Larger 50 X 20 m Plot	
1. Length of Woody debris >10cm wide & > 0.5 m long	0
2. Proportion of canopy species regeneration	0
3. Number of trees with hollows > 5 cm	0

Cover abundance scale 1-7			1 - 6 scale conversion	
1	<5% - Rare or few individuals	3 or less individuals	1	sparse <5%
2	<5% - uncommon	more than 3 - sparsely scattered	1	sparse <5%
3	<5% - common	consistent throughout plot	2	any no. < 5%
4a	<5% very abundant	many individuals throughout plot	2	any no. < 5%
4b	5% - 25%		3	5 - 25%
5	25% - 50%		4	25 - 50%
6	50% - 75%		5	50 - 75%
7	75% - 100%		6	75 - 100%

N 1 a
E 49

ID-1075

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14	1.
Site ID: both sides of proforma Q11	2.
Survey type: BB Include quadrate size, search area, transect length etc.	3.
Recorders: AC, DL, (TB), PR, JS, SH, AR	4.
Stratification and patch ID:	5
Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure: Corner paddock	
Photo number:	

Location recorded with GPS # or Tablet: 7 1:100,000 MAP NAME: GPS 781 8.

Unique Point ID #:	ZONE	EASTING	NORTHING	9.
		0		30.63959 150.06418
		0		

GPS accuracy: ± metres 10.

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes: 11.

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground

Ground Cover %: 12.

Bare soil	
Litter	
Timber	
Rock (type)	
Vegetation (type)	
Total 100%	

Vegetation community:

Mapped community: –

Field Community: ? Exotic Grassland. 13.

782
30.64321
150.05663

Structure and composition ❖ : 14.

Strata!:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:
Can	–	–	–
Shrub	–	–	–
Ground			

❖ Community structure should be described as per Specht et al 1995
!: Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
* 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤ Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF | **VEGETATION SURVEY PROFORMA P2** | Site ID: Q11 | 2.

Species	Presence	Strata	Species	Presence	Srtata
1 Brassica rapa		4	42		
2 Brassica iroq		2	43		
3 Trifolium sativa		3	44		
4 Avena fatua		3	45		
5 Sonchus oleareus		2	46		
6 Sclerophylla archilli		1	47		
7 Enchylaena tomentosa		1	48		
8 Lolium perenne	5		49		
9 Lepidium africanum		1	50		
10 Echium plantagoneum		3	51		
11 Chloris divercatum		2	52		
12 Solanum parviflorum		1	53		
13 Crassula colorata		3	54		
14 Vittadinia cuneata		2	55		
15 Trifolium arvensis		2	56		
16 centaurea calcitrapa		3	57		
17 Austrostipa aristaglumis	1		58		
18 Bromus arvensis		2	59		
19			60		
20			61		
21			62		
22			63		
23			64		
24			65		
25			66		
26			67		
27			68		
28			69		
29			70		
30			71		
31			72		
32			73		
33			74		
34			75		
35			76		
36			77		
37			78		
38			79		
39			80		
40			81		
41			82		

Transect Number	Number of hits (tally)		%
Native over-storey cover (%)	0 →		0
Native mid-story cover (%)	0 →		0
Native ground cover grasses (%)	1	1	2
Native ground cover shrubs (%)			0
Native ground cover other (%)	III	3	6
Exotic plant cover (%)	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ i	46	92

Larger 50 X 20 m Plot	
1. Length of Woody debris >10cm wide & > 0.5 m long	0
2. Proportion of canopy species regeneration	0
3. Number of trees with hollows > 5 cm	0

Cover abundance scale 1-7			1 - 6 scale conversion	
1	<5% - Rare or few individuals	3 or less individuals	1	sparse <5%
2	<5% - uncommon	more than 3 - sparsely scattered	1	sparse <5%
3	<5% - common	consistent throughout plot	2	any no. < 5%
4a	<5% very abundant	many individuals throughout plot	2	any no. < 5%
4b	5% - 25%		3	5 - 25%
5	25% - 50%		4	25 - 50%
6	50% - 75%		5	50 - 75%
7	75% - 100%		6	75 - 100%

N 3
E 47

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14 (1.)

Site ID: both sides of proforma Q12 (2.)

Survey type: BB (3.)
Include quadrate size, search area, transect length etc.

Recorders: AC, DL, (TB), PR, JS, SH, AR (4.)

Stratification and patch ID: (5.)

Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure
BORE

Photo number: GPS 782

Location recorded with GPS # or Tablet: (7.) 1:100,000 MAP NAME: (8.)

Unique Point ID #:	ZONE	EASTING	NORTHING
		0	
		0	

-30.64321 (9.)
150.05663

GPS accuracy: ± metres (10.)

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes: (11.)

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground

Ground Cover %: (12.)

Bare soil	
Litter	
Timber	
Rock (type)	
Vegetation (type)	
Total 100%	

Vegetation community: (13.)

Mapped community:

Field Community: Cropping

Structure and composition ❖ : (14.)

Strata!:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:
Can	–	–	–
Shrub	–	–	–
ground	0.1 – 1 m	80 – 100%	wheat

❖ Community structure should be described as per Specht et al 1995
! Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
* 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤ Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF | **VEGETATION SURVEY PROFORMA P2** | Site ID: Q12 | 2.

Species	Presence	Strata	Species	Presence	Srtata
1 Wheat	7		42		
2 Brassica rapa	3		43		
3 Sisymbrium loeselii	2		44		
4 Medicago poly	3		45		
5 Anagallis arvensis	2		46		
6 Vulpia myuros	1		47		
7 Lolium perenne	3		48		
8 Avena fatua	2		49		
9 Erodium cicutarium	1		50		
10			51		
11			52		
12			53		
13			54		
14			55		
15			56		
16			57		
17			58		
18			59		
19			60		
20			61		
21			62		
22			63		
23			64		
24			65		
25			66		
26			67		
27			68		
28			69		
29			70		
30			71		
31			72		
32			73		
33			74		
34			75		
35			76		
36			77		
37			78		
38			79		
39			80		
40			81		
41			82		

Transect Number	Number of hits (tally)	%
Native over-storey cover (%)	0 →	0
Native mid-story cover (%)	0 →	0
Native ground cover grasses (%)		0
Native ground cover shrubs (%)		0
Native ground cover other (%)		0
Exotic plant cover (%)	50	100

Larger 50 X 20 m Plot	
1. Length of Woody debris >10cm wide & > 0.5 m long	0
2. Proportion of canopy species regeneration	0
3. Number of trees with hollows > 5 cm	0

Cover abundance scale 1-7			1 - 6 scale conversion	
1	<5% - Rare or few individuals	3 or less individuals	1	sparse <5%
2	<5% - uncommon	more than 3 - sparsely scattered	1	sparse <5%
3	<5% - common	consistent throughout plot	2	any no. < 5%
4a	<5% very abundant	many individuals throughout plot	2	any no. < 5%
4b	5% - 25%		3	5 - 25%
5	25% - 50%		4	25 - 50%
6	50% - 75%		5	50 - 75%
7	75% - 100%		6	75 - 100%

10 – 1076

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14 (1.)

Site ID: both sides of proforma — Q13 (2.)

Survey type: BB (3.)
Include quadrate size, search area, transect length etc.

Recorders: AC, DL, (TB), PR, JS, SH, AR (4.)

Stratification and patch ID: (5.)

Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure
Site 6 - Middle Bore

Photo number:

Location recorded with GPS # or Tablet: GPS 783 (7.)

1:100,000 MAP NAME: (8.)

Unique Point ID #:	ZONE	EASTING	NORTHING	(9.)
		0		30.64352 150.06668
		0		

GPS accuracy: ± metres (10.)

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes: (11.)

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground

Ground Cover %: (12.)

Bare soil	
Litter	
Timber	
Rock (type)	
Vegetation (type)	
Total 100%	

Vegetation community: (13.)

Mapped community: Exotic Grassland.

Field Community:

Structure and composition ❖ : (14.)

Strata!:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:

❖ Community structure should be described as per Specht et al 1995
!: Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
* 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤ Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF | **VEGETATION SURVEY PROFORMA P2** | Site ID: Q13 |

	Species	Presence	Strata		Species	Presence	Srtata
1	Echium plantgonium	2		42			
2	Avena fatua	2		43			
3	Lolium perenne	3		44			
4	Triticum aestivum	7		45			
5	Brassica rapa	4		46			
6	Brassica sp	3		47			
7	Sonchus olearus	2		48			
8	Trifolium sativa	3	Medicago	49			
9	Enchymana tomentosa	1		50			
10				51			
11				52			
12				53			
13				54			
14				55			
15				56			
16				57			
17				58			
18				59			
19				60			
20				61			
21				62			
22				63			
23				64			
24				65			
25				66			
26				67			
27				68			
28				69			
29				70			
30				71			
31				72			
32				73			
33				74			
34				75			
35				76			
36				77			
37				78			
38				79			
39				80			
40				81			
41				82			

Transect Number	Number of hits (tally)	%
Native over-storey cover (%)		
Native mid-story cover (%)		
Native ground cover grasses (%)		
Native ground cover shrubs (%)		
Native ground cover other (%)		
Exotic plant cover (%)	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	100

Larger 50 X 20 m Plot	
1. Length of Woody debris >10cm wide & > 0.5 m long	0
2. Proportion of canopy species regeneration	0
3. Number of trees with hollows > 5 cm	0

Cover abundance scale 1-7			**1 - 6 scale conversion**	
1	<5% - Rare or few individuals	3 or less individuals	1	sparse <5%
2	<5% - uncommon	more than 3 - sparsely scattered	1	sparse <5%
3	<5% - common	consistent throughout plot	2	any no. < 5%
4a	<5% very abundant	many individuals throughout plot	2	any no. < 5%
4b	5% - 25%		3	5 - 25%
5	25% - 50%		4	25 - 50%
6	50% - 75%		5	50 - 75%
7	75% - 100%		6	75 - 100%

10 - 1076

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14	1.
Site ID: both sides of proforma Q~~3~~14	2.
Survey type: BB Include quadrate size, search area, transect length etc.	3.
Recorders: AC, DL, (TB), PR, JS, SH, AR	4.
Stratification and patch ID:	5
Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure Roma Bore Site 6	
Photo number:	

Location recorded with GPS # or Tablet: 7 1:100,000 MAP NAME: GPS 784 8.

Unique Point ID #:	ZONE	EASTING	NORTHING	9.
		0		30.64798 150.07594
		0		

GPS accuracy: ± metres 10.

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes:

11.

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground

Ground Cover %: 12.

Bare soil	
Litter	
Timber	
Rock (type)	
Vegetation (type)	
Total 100%	

Vegetation community:

13.

Mapped community:

Field Community: Exotic Grassland - Crops.

Structure and composition ❖ :

14.

Strata!:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:
Can	-	-	-
Shrub	-	-	-
Ground.			

❖ Community structure should be described as per Specht et al 1995
! Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
* 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤ Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF **VEGETATION SURVEY PROFORMA P2** Site ID: Q14

Species	Presence	Strata	Species	Presence	Srtata
1 Avenva fatua	3		42		
2 Echium plantgonium	3		43		
3 Lolium perenne	4		44		
4 Trifolium arvensis	2		45		
5 Sonchus oleracus	2		46		
6 Brassica rapa	3		47		
7 Brassica rou	2		48		
8 Sclerophylla birchilli	1		49		
9 Erodium crinitum	1		50		
10 Wheat Triticum	6		51		
11			52		
12			53		
13			54		
14			55		
15			56		
16			57		
17			58		
18			59		
19			60		
20			61		
21			62		
22			63		
23			64		
24			65		
25			66		
26			67		
27			68		
28			69		
29			70		
30			71		
31			72		
32			73		
33			74		
34			75		
35			76		
36			77		
37			78		
38			79		
39			80		
40			81		
41			82		

Transect Number	Number of hits (tally)	%
Native over-storey cover (%)	0 →	0
Native mid-story cover (%)	0 →	0
Native ground cover grasses (%)	~~////~~ –	~~5~~ 0
Native ground cover shrubs (%)	–	0
Native ground cover other (%)	~~//// ////~~ –	~~24~~ 0
Exotic plant cover (%)	//// //// //// //// //// //// //// //// //// ////	~~96~~ 100

Larger 50 X 20 m Plot	
1. Length of Woody debris >10cm wide & > 0.5 m long	0
2. Proportion of canopy species regeneration	0
3. Number of trees with hollows > 5 cm	0

Cover abundance scale 1-7			**1 - 6 scale conversion**	
1	<5% - Rare or few individuals	3 or less individuals	1	sparse <5%
2	<5% - uncommon	more than 3 - sparsely scattered	1	sparse <5%
3	<5% - common	consistent throughout plot	2	any no. < 5%
4a	<5% very abundant	many individuals throughout plot	2	any no. < 5%
4b	5% - 25%		3	5 - 25%
5	25% - 50%		4	25 - 50%
6	50% - 75%		5	50 - 75%
7	75% - 100%		6	75 - 100%

ID- 1077

PARSONS BRINCKERHOFF

VEGETATION SURVEY PROFORMA P1

Date: 13.10.14 (1.)

Site ID: both sides of proforma Q #15 (2.)

Survey type: BB (3.)
Include quadrate size, search area, transect length etc.

Recorders: AC, DL, (TB), PR, JS, SH, AR (4.)

Stratification and patch ID: (5)

Location details: Property name, Lot Plan #, Road Name, Side of Road, land tenure
Site 6 - Nth of Bore 5m QS.

Photo number:

Location recorded with GPS # or Tablet: (7) 1:100,000 MAP NAME: GPS 785 (8.)

Unique Point ID #:	ZONE	EASTING	NORTHING	(9.)
		0		30.63827 150.07849
		0		

GPS accuracy: ± metres (10.)

Note: All waypoints should be recorded in map datum WGS 84

Habitat Assessment & other site description notes: (11.)

Slope:

Aspect:

Landform (Quadrat) e.g. hillside, flat:

landform (broad):

Nearest Drainage line / catchment:

Soil: e.g. Clay, Sand, Loam Geology type:

Evidence of disturbance:

Community age estimate:

Weeds %:

Canopy

Sub-canopy

Shrub

Ground

Ground Cover %: (12.)

Bare soil	
Litter	
Timber	
Rock (type)	
Vegetation (type)	
Total 100%	

Vegetation community: (13.)

Mapped community: Nothing - Cracking clay.

Field Community:

Structure and composition ❖ : Exotic Grassland (14.)

Strata!:	Height: range & median	% foliage cover*:	Dominant spp. and dominance¤:

❖ Community structure should be described as per Specht et al 1995
! Emergent (E), >8m - tree layers (T1, T2…Tn), <8m - shrub layers (S1, S2…Sn), ground cover (gc)
* 100-70%(4), 70-30%(3), 30-10% (2), <10% (1)
¤ Dominant (d), Associated (a), co-dominant (cd), supressed (s) or combination

PARSONS BRINCKERHOFF