Kanmantoo Mine Fauna Survey

Spring 2015

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Prepared by EBS Ecology for Hillgrove Resources

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Cover photograph: Diamond Firetail (*Stagonopleura guttata*) observed within the Kanmantoo Mining Lease.

EBS Ecology
3/119 Hayward Avenue
Torrensville, South Australia 5031
t: 08 7127 5607
http://www.ebsecology.com.au
email: info@ebsecology.com.au

EXECUTIVE SUMMARY

EBS Ecology has been commissioned by Hillgrove Resources for the past five years to undertake an annual fauna monitoring program across the Kanmantoo Copper Mining Lease. This is also the second year that EBS has undertaken annual fauna monitoring within the new Significant Environmental Benefit (SEB) areas, adjacent to the Kanmantoo Copper Mine project site.

Objectives of the fauna monitoring program (as outlined in the PEPR document) within the mining lease include:

- Annual abundance and diversity surveys;
- Targeted surveys for threatened species;
- Visual inspections for wetland species and
- Database and document reviews, including a search for all incidents of fauna mortalities.

The spring 2015 survey was undertaken across three days: 27-29th October 2015. A roaming process was used to survey for birds both within the Mining Lease (ML) and Significant Environmental Benefit (SEB) areas. The ML was surveyed for birds on the 27th and 29th October; the ML was surveyed for possums on night of the 28th October. The SEB area was surveyed for birds on 28-29th October and for possums on the evening of the 27th October.

Spotlighting along established transects within *E. odorata* (Peppermint Box) Woodland habitats were undertaken in search of the Common Brushtail Possum (*Trichosurus vulpecular*). Transects were surveyed over a two night period (ML and SEB area) for two hours commencing approximately one hour after dusk. Any other species observed opportunistically were also recorded.

A total of 948 bird observations of 50 bird species were recorded at random locations throughout the ML and SEB project areas. Out of the 50 bird species recorded, four of these were introduced species. The most abundant species present were the White-winged Chough (*Corcorax melanorhamphos*) (97 individuals), Adelaide Rosella (*Platycercus elegans adelaidae*) (85 individuals) and the Tree Martin (*Petrochelidon nigricans*) (68 individuals).

Six species of conservation significance were recorded within the project area during the spring 2015 survey, all of which were observed within the ML and five of which were observed in the SEB area. The species of conservation significance observed during the spring 2015 survey were:

- State vulnerable Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*) (eight individuals);
- State rare White-winged Chough (*Corcorax melanorhamphos*) (97 individuals);
- State rare Peregrine Falcon (*Falco peregrinus*) (four individuals);
- Nationally migratory Rainbow Bee-eater (*Merops ornatus*) (three individuals);
- State rare Elegant Parrot (*Neophema elegans*) (19 individuals) and
- State vulnerable Diamond Firetail (*Stagonopleura guttata*) (five individuals).

Seven mammal species and a total 117 observations were recorded during the spring 2015 survey. The Common Brushtail Possum (*Trichosurus vulpecula*) was targeted during a night of spotlighting within the SEB areas (27/10/15) with no observations recorded, and on the mining lease (28/10/15) with 21 observations recorded.

Bird guilds can provide an understanding of the types of bird groups that utilise an ecosystem over time. The spring 2015 survey showed that a diverse number of bird groups were utilising varied habitat resources across different habitat types within the ML and SEB area, during the spring period.

In 2015, 50 species totalling 998 individuals were recorded (including the ML and SEB areas). In comparison with previous years, this has returned to previous species and abundance levels following a decline in the results from 2014. In 2014, 31 bird species totalling 381 individuals (including two invasive species) were observed throughout the project area during two days of surveys. In 2013, 48 bird species and 575 individuals were recorded. In 2012, 58 species and 668 individuals were recorded and in 2011, 40 species and 305 individuals were recorded during the spring survey.

To date, Hillgrove Resources has made a positive contribution toward woodland enhancement and the planned rehabilitation of the site at the time of the mines closure. Rehabilitation operations continue to see areas of native woodland and grassland expand within the mining lease area and SEB areas.

The following general recommendations are listed below:

- Undertake fauna surveys during optimal spring periods (as per the long term scope of the project) to monitor the presence of conservation significant and targeted fauna species;
- Monitor Peregrine Falcon behaviour around the mine lease particularly around their breeding season between July to December to determine whether they are utilising the pit as a breeding site. This may require a single/earlier visit at the beginning of the 2015 breeding season
- Investigate the methodology proposed within the PEPR (Coffey, 2012) with regard to monitoring Diamond Firetail within the ML and determine whether it is effective with regard to mitigation measures. Previous recommendation has been to survey the Diamond Firetail population in the ML to determine the overall population size, the number and size of Diamond Firetail flocks and the habitat use of the birds in the ML area. Conducting monthly surveys would provide a much better picture of habitat usage and population size of this species, and
- Continue the positive contribution toward planned rehabilitation, woodland enhancement and SEB programs that add to species diversity both on site and outside of the mining lease area. This can be achieved by establishing new areas of native grassland, woodland and habitat within the mining lease and SEB areas which will assist with providing potential feeding habitat for fauna species.

Table of Contents

List of Tables

List of Figures

List of Maps

1 INTRODUCTION

EBS Ecology has been commissioned by Hillgrove Resources for the past five years to undertake an annual fauna monitoring program across the Kanmantoo Copper Mining Lease. This is also the second year that EBS has undertaken annual fauna monitoring within the new Significant Environmental Benefit (SEB) areas, adjacent to the Kanmantoo Copper Mine project site.

This ongoing monitoring within both the mining lease and SEB areas, assist in satisfying some of the Avoidance, Mitigation and Management Measures set out in the Kanmantoo Copper Program for Environment Protection and Rehabilitation (PEPR) (Coffey 2009). The PEPR is the key operational document for the mining project and details information on environmental control measures and outcome-based performance criteria. Fauna monitoring, in association with a series of other mitigation measures, has been identified in the document to be undertaken annually.

1.1 Objectives

Objectives of the fauna monitoring program (as outlined in the PEPR document) within the mining lease include:

- Annual abundance and diversity surveys;
- Targeted surveys for threatened species;
- Visual inspections for wetland species and
- Database and document reviews, including a search for all incidents of fauna mortalities.

Targeted surveys have primarily focused on (but are not limited to) threatened species, Diamond Firetail (*Stagonopleura guttata*) (State vulnerable) and the Common Brushtail Possum (*Trichosurus vulpecula*) (State rare). These species are thought to be indicator species, whose presence or absence in a given environment is a sign of the overall health of its ecosystem (The American Heritage Dictionary of Student Science 2014).

Hillgrove Resources has an overall target that ‘operations must not result in a net loss of biodiversity’. The objective of this document is to report on variations in observed species against the pre-mining benchmark (Coffey 2012), with particular reference to the fauna of conservation significance as well as other species observed during annual surveys completed by EBS. This document also aims to report against the total number of individuals observed for each species (during annual surveys), with reference to the pre-mining benchmark surveys.

This report sets out the findings of the spring 2015 survey, which also targeted the following species:

- White-winged Chough (*Corcorax melanorhamphos*) (State rare);
- Peregrine Falcon (*Falco peregrinus*) (State rare);
- Hooded Robin (*Melanodryas cucullata cucullata*) (State rare);
- Rainbow Bee-eater (*Merops ornatus*) (nationally migratory) and
- Elegant Parrot (*Neophema elegans*) (State rare).

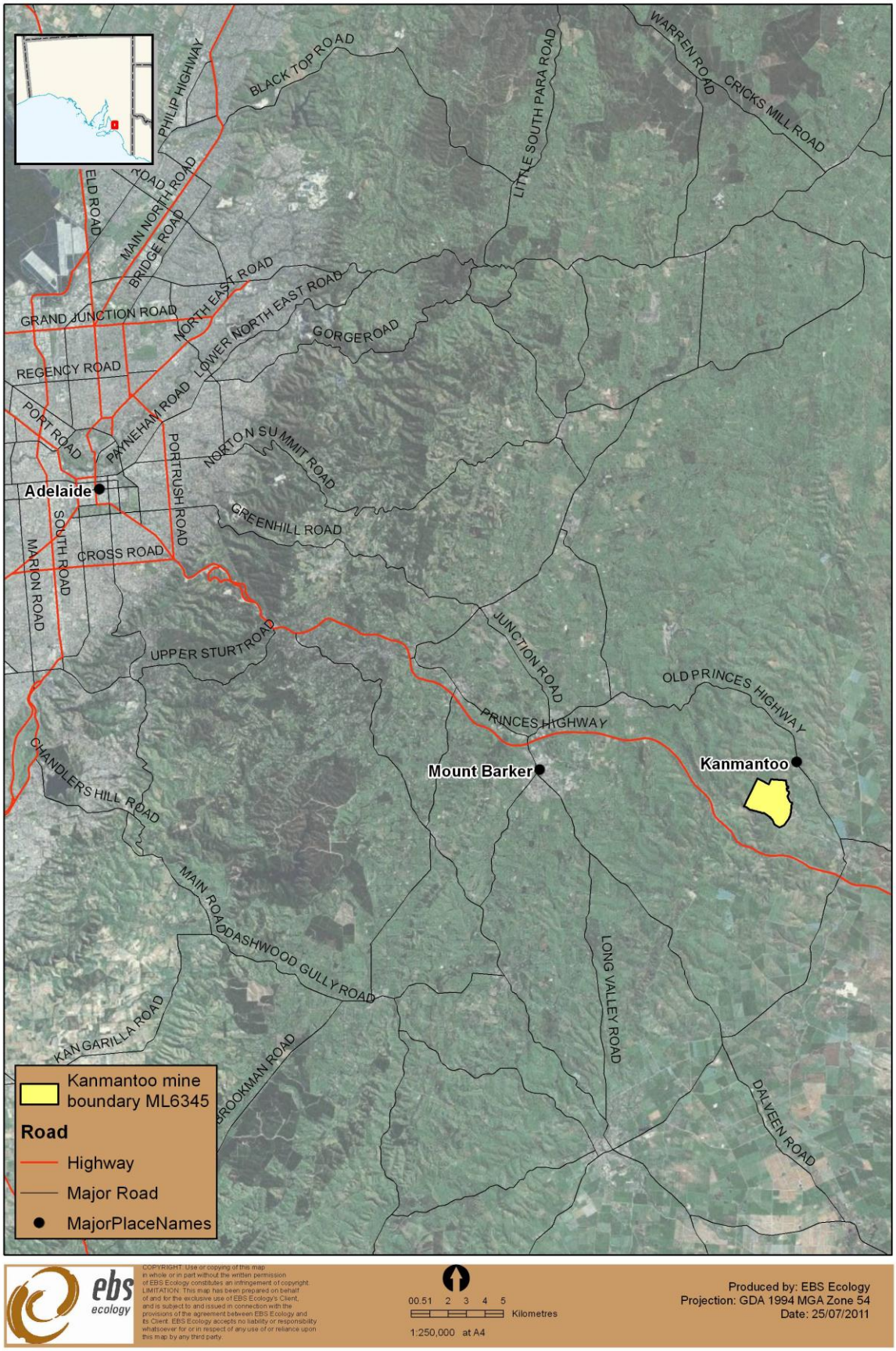
The aim of the SEB project is to identify, protect and enhance any native vegetation remnants within the new areas of farming land allocated to SEB-offset establishment for the life of the mine extension. One of the overall objectives is to survey for native birds and other animals which will be used to establish future control programs.

1.2 Project area

The project area is located approximately 45 km south-east of Adelaide in the southern Mount Lofty Ranges of South Australia and 1.5 km south-west of the Kanmantoo township (Map 1). The area is representative of a transitional zone on the eastern face of the Mount Lofty Ranges, between the Adelaide Hills woodland regions and the Murray River Plains mallee. It has a long term average rainfall of 349.4mm (Figure 1) and encompasses a variety of soil types and geological structures, conducive to an assortment of vegetation types and habitat niches.

The project area has been used previously for mining activities, the first during the mid-nineteenth century and then again from 1971 to 1976 (Hillgrove Resources 2007). Over the past 150 years, much of the Mining Lease (ML) has been extensively cleared for cropping, whilst the majority of the vegetated areas have been grazed by domestic stock. As a result, only small remnant patches of native vegetation in the mining lease have persisted, including native grasslands and woodland communities.

The new SEB offset areas are adjacent to the Kanmantoo Mine. SEB offset areas associated with the Life of Mine (LOM) extension, have been located as near as possible to the Mine Lease (ML) on suitable Hillgrove-owned land parcels. The new SEB project area is approximately 109.5 hectares and is comprised of five properties. All properties within the new SEB areas have been managed under a mixed cropping / sheep grazing regime for over 100 years. Cropping has been confined to the flats and grazing has been on crop stubble and the higher/rockier areas. As a result, there are only small remnant patches of native vegetation remaining in the new SEB areas which have persisted, including native grasslands and a mallee community.



Map 1. Location of Kanmantoo Copper Mine.

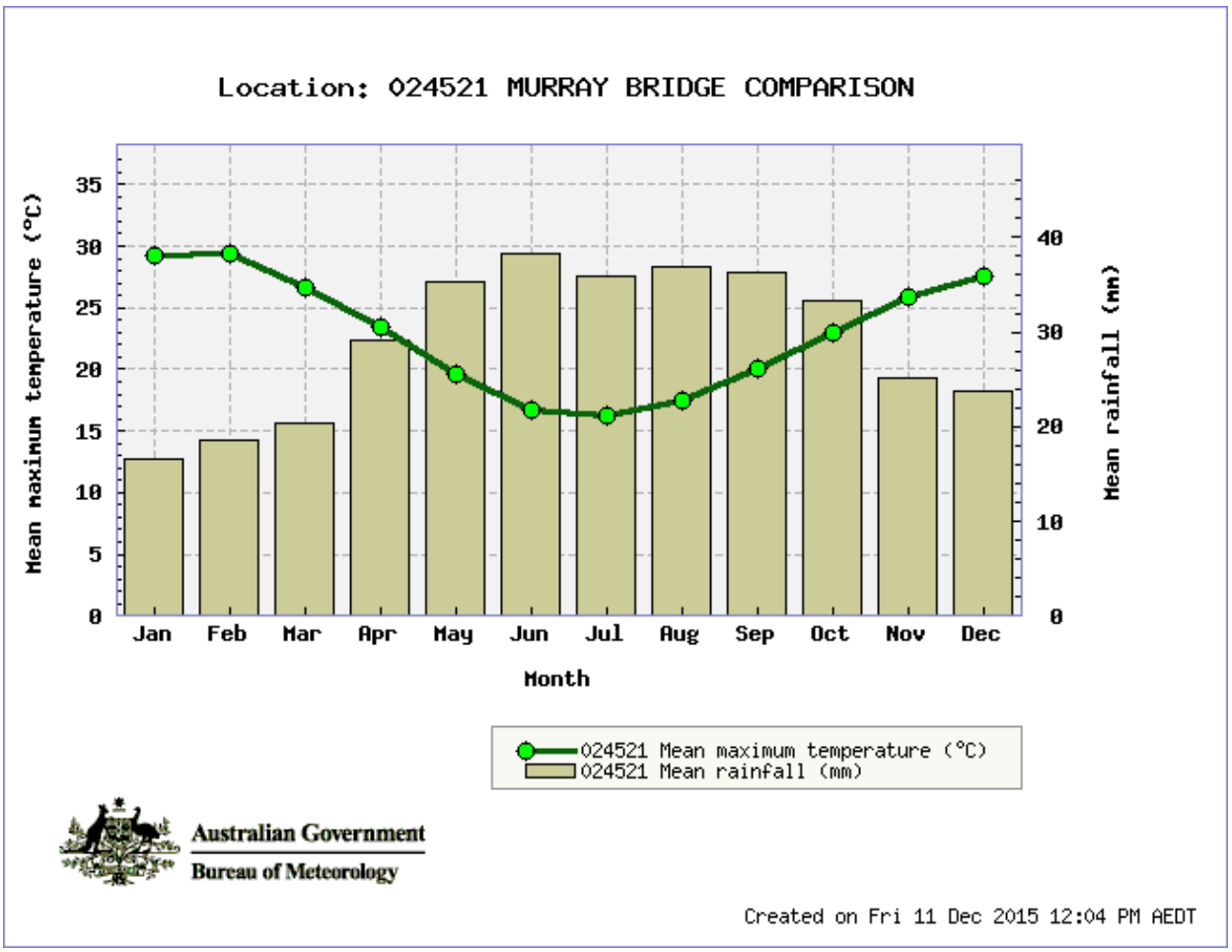


Figure 1. Mean annual rainfall and temperature statistics, Murray Bridge Weather Station (Source Bureau of Meteorology 2015).

Much of the remaining remnant vegetation will now be set aside and managed for conservation as part of the SEB requirements. This includes areas that have, in the past been impacted by mining activities and have recently been decommissioned and rehabilitated. The areas vary from good quality remnant vegetation to open, cleared ex-cropping and mining land with little or no native vegetation remaining. Revegetation programs have been proposed in an attempt to restore the disturbed landscapes to pre-European condition. Weed management strategies and feral animal control programs are also be undertaken across the SEB areas to maximise conservation objectives.

A more thorough background has been documented in the *Kanmantoo Copper Project MARP* (Coffey 2009) and the *Kanmantoo Copper Project Mining Lease Proposal, Main Report* (Hillgrove Resources 2007).

2 METHODS

2.1 Field survey

2.1.1 Weather conditions during the survey

Weather conditions for the survey were hot with moderate winds in the afternoons. Night temperatures were cool and no rainfall was recorded during the survey (Table 1).

Table 1 Daily weather observations during the spring survey 2015, Murray Bridge Weather Station

Date	Min temp.	Max temp.	Rain	Time	Temp.	Rel. humid.	Wind direct-ion	Wind speed	Activity
	°C		mm		°C	%		km/h	
27/11/2015	6.3	27.0	0	9:00	12	63	SE	9	Bird surveys, spotlighting for possums SEB Area
				15:00			SSW	11	
28/11/2015	11.0	31.3	0	9:00	15.5	72	NNE	2	Bird surveys, spotlighting for possums ML
				15:00			SSW	28	
29/11/2015	12.5	35.5	0	9:00	17.0	80	WSW	7	Bird surveys
				15:00			ENE	17	

Source: Bureau of Meteorology. www.bom.gov.au

2.1.2 Bird survey

The spring 2015 survey was undertaken across three days: 27-29th October 2015. A roaming process was used to survey for birds both within the Mining Lease (ML) and Significant Environmental Benefit (SEB) areas. The ML was surveyed for birds on the 27th and 29th October; the ML was surveyed for possums on night of the 28th October. The SEB area was surveyed for birds on 28-29th October and for possums on the evening of the 27th October. A single surveyor undertook the roaming surveys for the equivalent of one hour (two half an hour periods each) in the morning and afternoon. Habitat usage by birds was also recorded whilst surveying these areas. Repeated locations from previous surveys was used covering main habitat types across the site; 14 roaming locations were surveyed within the ML and nine locations within the SEB area, to ensure an even spread across the project areas (Map 2).

The Diamond Firetail (*Stagonopleura guttata*) was surveyed as part of the roaming process which was undertaken in its preferred habitat type of *Eucalyptus odorata* (Peppermint Box) Woodland. Other bird species targeted within this vegetation community were the Rainbow Bee-eater (*Merops ornatus*), White-winged Cough (*Corcorax melanorhamphos*), Peregrine Falcon (*Falco peregrinus*) and the Elegant Parrot (*Neophema elegans*).

2.1.3 Fauna

Spotlighting along established transects within *E. odorata* (Peppermint Box) Woodland habitats were undertaken in search of the Common Brushtail Possum (*Trichosurus vulpecular*). Transects were

surveyed over a two night period (ML and SEB area) for two hours commencing approximately one hour after dusk. Any other species observed opportunistically were also recorded.

2.2 Limitations

Although effort was taken to ensure all visibly present species were observed and recorded, it is likely that not all species present were observed in the three day survey window. Access has been limited within the ML to some areas due to the mines expansion, however generally speaking the observer was able to access most areas during the spring 2015 survey as part of the roaming process as well as during spotlighting. Whilst the Common Brush-tail Possum (*Trichosurus vulpecula*) was recorded within the ML on the night of 28/10/15, the presence of a full moon (on both nights of spotlighting) may have influenced the abundance of nocturnal bird and mammal species hunting at night.

Map 2. Bird roaming transects across the Kanmantoo mining lease and SEB area.

3 RESULTS

3.1 Bird survey

A total of 948 bird observations of 50 bird species were recorded at random locations throughout the ML and SEB project area's (**Error! Reference source not found.**). Out of the 50 bird species recorded, four f these were introduced species. The bird observations recorded included both those taken at set locations as well as those recorded opportunistically. Whilst these locations were considered random, they were generally a repeat of where surveys have been previously undertaken (since monitoring began both in the ML and SEB areas). The most abundant species present were the White-winged Chough (*Corcorax melanorhamphos)* (97 individuals), Adelaide Rosella (*Platycercus elegans adelaidae*) (85 individuals) and the Tree Martin (*Petrochelidon nigricans)* (68 individuals).

Six species of conservation significance were recorded within the project area during the spring 2015 survey, all of which were observed within the ML and five of which were observed in the SEB area (Map 3). This number observed in 2015 is comparative to the number recorded during the 2011 and 2012 surveys and is an increase from the 2014 results. The species of conservation significance observed during the spring 2015 survey were:

- State vulnerable Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*) (eight individuals);
- State rare White-winged Chough (*Corcorax melanorhamphos*) (97 individuals);
- State rare Peregrine Falcon (Falco peregrinus) (four individuals);
- Nationally migratory Rainbow Bee-eater (*Merops ornatus*) (three individuals);
- State rare Elegant Parrot (*Neophema elegans*) (19 individuals) and
- State vulnerable Diamond Firetail (*Stagonopleura guttata*) (five individuals).

These species are discussed briefly below in context to the observations recorded on site during the spring 2015. Consistent with other surveys completed at the site, bird species of conservation significance were concentrated north of the pit within the ML. This can be attributed to the area containing the largest patches of remnant and revegetated areas.

There were nine species which recorded a singular observation during the spring 2015 survey, two of which were cuckoo species. These included the Australian Owlet-nightjar (*Aegotheles cristatus*), Pallid Cuckoo (*Cacomantis pallidus*), Horsfield's Bronze Cuckoo (*Chalcites basalis*), Laughing Kookaburra (*Dacelo novaeguineae*), Little Eagle (*Hieraaetus morphnoides*), Welcome Swallow (*Hirundo neoxena*), Red-capped Robin (*Petroica goodenovii*), Tawny Frogmouth (*Podargus strigoides*) and Grey Currawong (*Strepera versicolor melanoptera*). The Australian Owlet-nightjar, Pallid and Horsfield's Bronze Cuckoo, Little Eagle and Tawny Frogmouth, were observed within woodland north of the pit within the ML. The Tawny Frogmouth was observed during the spotlighting survey within the ML and the Australian Owlet-nightjar was heard calling within bird roam patch 4 (Map 2).

Table 2 Bird species observed during the spring survey 2015 in both the ML and SEB areas (point count).

SPECIES NAME	COMMON NAME	EPBC	NPW	Exotic	Point Count	OPP	Total
Acanthiza chrysorrhoa	Yellow-rumped Thornbill				90		90
Aegotheles cristatus	Australian Owlet-nightjar				1		1
Alauda arvensis	Eurasian Skylark			*	3		3
Anthochaera carunculata	Red Wattlebird				15		15
Artamus cyanopterus	Dusky Woodswallow				13		13
Cacatua sanguinea	Little Corella				54		54
Cacomantis pallidus	Pallid Cuckoo				1		1
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo		V		3	5	8
Carduelis carduelis	European Goldfinch			*	2		2
Chalcites basalis	Horsfield's Bronze Cuckoo				1		1
Chenonetta jubata	Australian Wood Duck					19	19
Climacteris picumnus	Brown Treecreeper				8		8
Colluricincla harmonica	Grey Shrike-thrush				14		14
Coracina novaehollandiae	Black-faced Cuckoo-shrike				3		3
Corcorax melanorhamphos	White-winged Chough		R		97		97
Corvus coronoides	Australian Raven				25	1	26
Dacelo novaeguineae	Laughing Kookaburra				1		1
Daphoenositta chrysoptera	Varied Sittella				3		3
Eolophus roseicapilla	Galah				60		60
Epthianura albifrons	White-fronted Chat				2		2
Falco berigora	Brown Falcon				3	1	4
Falco peregrinus	Peregrine Falcon		R			4	4
Gavicalis virescens	Singing Honeyeater				14		14
Grallina cyanoleuca	Magpie-lark				3		3
Gymnorhina tibicen	Australian Magpie				57		57
Hieraaetus morphnoides	Little Eagle				1		1
Hirundo neoxena	Welcome Swallow				1		1
Malurus cyaneus	Superb Fairy-wren				4		4
Melithreptus brevirostris	Brown-headed Honeyeater				19		19
Merops ornatus	Rainbow Bee-eater	Mi			3		3
Milvus migrans	Black Kite				2		2
Neophema elegans	Elegant Parrot		R		19		19
Pachycephala rufiventris	Rufous Whistler				3		3
Pardalotus striatus	Striated Pardalote				26		26
Passer domesticus	House Sparrow			*	5		5
Petrochelidon nigricans	Tree Martin				68		68
Petroica goodenovii	Red-capped Robin				1		1
Phylidonyris novaehollandiae	New Holland Honeyeater				21		21
Platycercus elegans	Crimson Rosella				85		85
Podargus strigoides	Tawny Frogmouth					1	1
Pomatostomus superciliosus	White-browed Babbler				7	1	8
Psephotus haematonotus	Red-rumped Parrot				19		19
Ptilotula penicillata	White-plumed Honeyeater				13		13
Rhipidura leucophrys	Willie Wagtail				22		22
Smicrornis brevirostris	Weebill				56		56
Stagonopleura guttata	Diamond Firetail		V		5		5
Strepera versicolor melanoptera	Grey Currawong				1		1
Sturnus vulgaris	Common Starling			*	52		52

SPECIES NAME	COMMON NAME	EPBC	NPW	Exotic	Point Count	OPP	Total
Threskiornis spinicollis	Straw-necked Ibis				6		6
Vanellus miles	Masked Lapwing				4		4
		Total Abundance:			**916**	**32**	**948**
		Total Diversity:			**47**	**7**	**50**

SA: South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes: CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **Mi:** Migratory. **R:** Rare. No species with national conservation status were observed; therefore column was not added to table.
*Denotes introduced species

The conservation significant species that were recorded during the spring 2015 survey are described in further detail below and are shown in Map 3.

3.1.1 Yellow-tailed Black Cockatoo (Calyptorhynchus funereus)

Three Yellow-tailed Black Cockatoo were observed opportunistically on dusk at the carpark entrance to the mining lease. Five individuals were observed flying/feeding within the pine trees located within the Malawa property of the SEB area.

3.1.2 White-winged Chough (Corcorax melanorhamphos)

White-winged choughs were observed over eight different locations, seven within the ML and one within the SEB area, totally 97 observations and making this species the most abundant during the spring 2015 survey. This number is similar to the 2012 spring survey and in 2013; choughs were observed at the acid tailings dam in one large group. White-winged choughs build deep, cup-shaped nest of grasses held together with mud or sometimes manure in a tree fork. Breeding is communal with all members of the family helping to raise the young. This species can be considered common within the ML, with many mud nests showing evidence of breeding occurring on site. Large groups of choughs were observed this survey including 29 individuals at patch 7 of the ML (Map 2).

3.1.3 Peregrine Falcon (Falco peregrinus)

A pair of Peregrine Falcon was observed opportunistically on dusk, flying from the chimney stacks which were noticeable from the carpark entrance to the mining lease. The same pair was observed within the Malawa property flying toward the mining lease, with one resting for a short period on a stobie pole (Figure 2).

3.1.4 Rainbow Bee-eater (Merops ornatus)

Two Rainbow Bee-eaters were observed flying through and then resting within woodland in patch 1 (Map 2). This species has been previously recorded within the ML, generally in higher numbers. The Rainbow Bee-eater occurs in open woodlands and shrubland, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands (Gibson 1986) and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages (Badman 1989). Its ability to

undertake long-distance movements makes this species highly mobile.

3.1.5 Elegant Parrot (Neophema elegans)

The State rare Elegant Parrot was observed at nine locations across the site, eight within the ML and at one location within the SEB area. A total of 19 individuals were recorded during the spring 2015 survey and observations included feeding on the ground (Figure 3) and flying into hollows (patch 4 within the ML – Map 2). In comparison, 16 individuals were observed in 2012, and 12 in 2013. This species is most often encountered in flocks of 20-100 or more, except in the breeding season when they tend to be found either in pairs or small parties. Like other *Neophema* species, it is quiet and unobtrusive and forages almost entirely on the ground.

3.1.6 Diamond Firetail (Stagonopleura guttata)

The Diamond Firetail was observed in two separate locations, both of which were on the boundary of the mining lease. A single observation was made of a firetail perched on a dead tree within patch 4 (Map 2) and four individuals were observed feeding in long grass, fleeting from the ground to the lower branches of tree limbs in patch 13 (Figure 4). Diamond Firetails live in a wide range of eucalypt dominated vegetation communities that typically have a grassy understorey, including woodland, forest and mallee. This preferred habitat type correlates with the grassy understorey/Blue Gum Woodland upper storey habitat where the Diamond Firetails were observed within the ML. They are ground-feeders that predominantly eat ripe and half-ripe seeds of various grasses but are also known to feed on seeds of herbs, bushes and trees as well as insects and worms (Immlemann 1982, Read 1994).

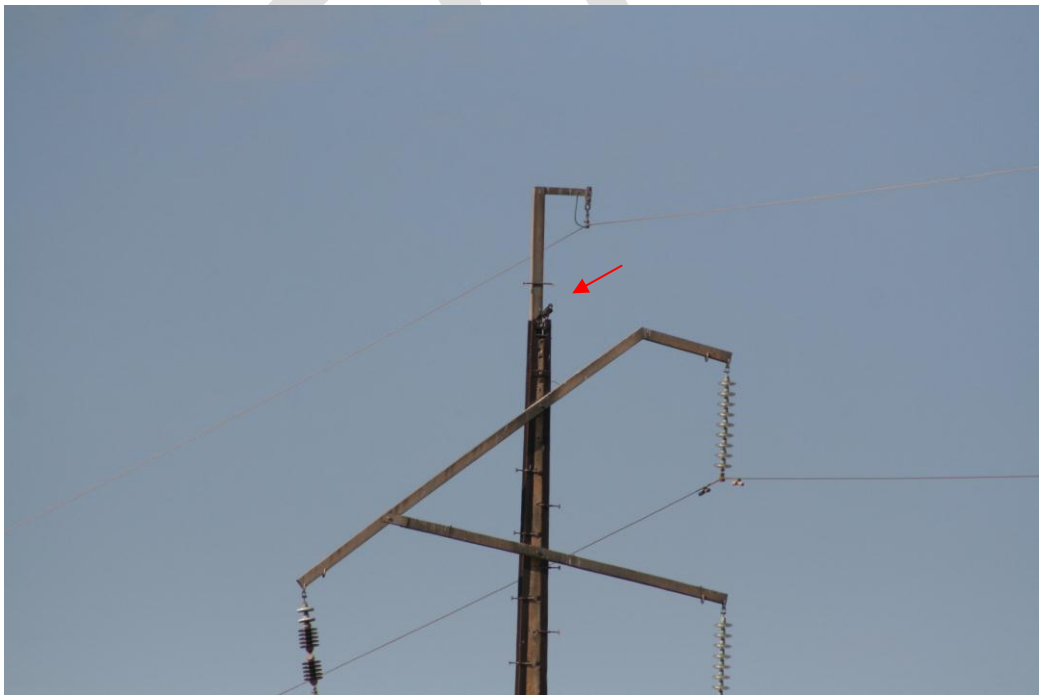


Figure 2. Peregrine Falcon was observed resting on a stobie pole within the Malawa property (SEB area).

Figure 3. Elegant Parrot observed feeding on the ground within the ML.

Figure 4. Diamond Firetail were observed feeding within the ML.

Map 3. Location of threatened birds across the Kanmantoo mining lease and SEB area.

3.2 Mammal and nocturnal fauna survey

3.2.1 Common Brushtail Possum (Trichosurus vulpecula)

Seven mammal species and a total 117 observations were recorded during the spring 2015 survey (**Error! Reference source not found.**). The Common Brushtail Possum (*Trichosurus vulpecula*) as targeted during spotlighting within the SEB areas (27/10/15) with no observations recorded and on the mining lease (28/10/15) with 21 observations recorded (Map 4). Two female adult possums were observed with juveniles on their backs, which demonstrated breeding had occurred onsite. In comparison to previous spring surveys conducted within the mining lease, 43 individuals were recorded in 2011, 88 individuals in 2012 and 53 individuals in 2013.

It is expected that the Common Brushtail Possum was not observed within the SEB areas based on the lack of preferred habitat and presence of suitable hollows for protection. This species prefers eucalypt and sheoak woodlands where they often use tree hollows as preferred den sites. Brushtail Possums typically use hollows that are approximately 10 cm in diameter (Ecological Associates 2006). They have strong site fidelity, limited mobility across fragmented landscapes and are vulnerable to fox and cat predation which inhibits their ability to relocate to other suitable areas (Ecological Associates 2006).

Two adult Red Fox (*Vulpes vulpes*) and two pups were observed on the mining lease and the White-striped Free-tailed Bat (*Austronomus australis*) could be heard flying above the tree canopy around patches 1 and 2 (Map 2).

The spring 2015 survey recorded high numbers of the Western Grey Kangaroo (*Macropus fuliginosus*) (52 observations) and a single Euro (*Macropus robustus*). Eight European Hares (*Lepus europaeus*) were observed across the mining lease and SEB areas, compared with none during the 2014 survey, and the European Rabbit (*Oryctolagus cuniculus*) recorded 27 observations in total.

Table 3 Species observed during spotlighting surveys on the ML and SEB areas, spring 2015.

SPECIES NAME	COMMON NAME	NPW	Spotlighting	OPP	Total
Austronomus australis	White-striped Free-tailed Bat		3		3
Lepus europaeus	European Brown Hare		3	5	8
Macropus fuliginosus	Western Grey Kangaroo		15	37	52
Macropus robustus	Euro			1	1
Oryctolagus cuniculus	Rabbit (European Rabbit)		11	16	27
Trichosurus vulpecula	Common Brushtail Possum	R	21		21
Vulpes vulpes	Fox (Red Fox)		4	1	5
		Total Abundance:	**57**	**60**	**117**
		Total Diversity:	**6**	**5**	**7**

Map 4. Spotlighting results across the Kanmantoo mining lease and SEB area.

4 DISCUSSION

4.1 Bird guilds

Bird guilds can provide an understanding of the types of bird groups that utilise an ecosystem over time. The spring 2015 survey showed that a diverse number of bird groups were utilising varied habitat resources across different habitat types within the ML and SEB area, during the spring period.

In 2015, 50 species totalling 998 individuals were recorded (including the ML and SEB areas). In comparison with previous years, this has returned to previous species and abundance levels following a decline in the results from 2014. In 2014, 31 bird species totalling 381 individuals (including two invasive species) were observed throughout the project area during two days of surveys. In 2013, 48 bird species and 575 individuals were recorded. In 2012, 58 species and 668 individuals were recorded and in 2011, 40 species and 305 individuals were recorded during the spring survey. Although 2015 was a dry year in terms of rainfall, the spring 2015 survey results indicated that conditions were favourable for bird reproduction and utilisation of food resources to a diverse group of birds. Species displaying breeding behaviours within the ML included Trees Martins (observed flying in and out of tree hollows), Elegant Parrots (observed also flying in and out of hollows) and the Willie Wagtail (*Rhipidura leucophrys*), Australian Magpie (*Gymnorhina tibicen*) and Weebill (*Smicrornis brevirostris*), which were all observed feeding young (patch 3 within the ML).

Different guilds require different habitats with more guilds providing an indication of habitat diversity. Species per guild can indicate habitat quality, abundance or possibly complexity. Guilds have been divided below to demonstrate species diversity across the project area:

4.1.1 Woodland birds

The woodland area north of the pit (within the ML) supported a good diversity of woodland birds. Patch 1 (Map 2) supports habitat for Striated Pardalote (*Pardalotus striatus*), Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*), Black-faced Cuckoo-shrike (*Coracina novaehollandiae*), Weebill, Grey Shrike-thrush (*Colluricincla harmonica*), Pallid Cuckoo (*Cacomantis pallidus*), Brown Treecreeper (*Climacteris picumnus*) (Figure 5), Varied Sitella (*Daphoenositta chrysoptera*), Red-rumped Parrot (*Psephotus haematonotus*) and Dusky Woodswallow (*Artamus cyanopterus*).

Other birds that favoured good vegetation cover, that were present during the spring 2015 survey, included: the White-browed Babbler (*Pomatostomus superciliosus*) (Malawa property in the SEB area), Rufous Whistler (*Pachycephala rufiventris*) (patches 7, 13 and 14) and the Red-capped Robin (*Petroica goodenovii*) (patch 17).

4.1.2 Seed eaters

The report has already detailed that the threatened species Elegant Parrot and Diamond Firetail were observed feeding on grass seeds during the spring 2015 survey. Other seed eaters observed during the current survey were the Little Corella (*Cacatua sanguinea*), White-faced Chat (*Epthianura albifrons*),

Red-rumped Parrot, Adelaide Rosella (*Platycercus elegans*) and Galah (*Eolophus roseicapilla*).

4.1.3 Honeyeaters/nectar feeders

A good diversity of honeyeaters was observed within the ML and SEB areas. This included the White-plumed Honeyeater (*Ptilotula penicillata*) (ML/SEB), Brown-headed honeyeater (*Melithreptus brevirostris*) (ML/SEB), Red Wattlebird (*Anthochaera carunculata*) (ML/SEB), Singing Honeyeater (*Gavicalis virescens*) (ML) and New Holland Honeyeater (*Phylidonyris novaehollandiae*) (SEB).

4.1.4 Waterbirds

The Australian Wood Duck (*Chenonetta jubata*) was observed opportunistically (19 observations) resting on a pool of water off the Haul Road. Straw-necked Ibis (*Threskiornis spinicollis*) were observed flying over patch 4 within the ML. The year 2015 has been dry in terms of rainfall, with little to no water remaining by the time the spring survey was completed.

4.1.5 Bird of prey

The Brown Falcon (*Falco berigora*) was observed both within the ML and SEB areas; this included in patch 3, patch 6 and patch 15 (Map 2). A single observation of the Little Eagle (*Hieraaetus morphnoides*) was recorded for the first time, soaring high above woodland in patch 4. Two observations of the Black Kite (*Milvus migrans*) were observed during the spring 2015 survey, one of which was in patch 23 located within the new SEB areas.

4.2 Common Brushtail Possum

Spotlighting along established transects within *E. odorata* (Peppermint Box) Woodland habitats were undertaken in search of the Common Brushtail Possum. During the spring 2015 survey, 21 observations of the Common Brushtail Possum was recorded within the mining lease. In comparison to previous spring surveys, nine individuals were recorded in 2014, 53 individuals in 2013, 88 individuals in 2012 and 43 individuals were recorded in 2011. This is the second year possums have been targeted (through spotlighting) within the SEB area; none were recorded in 2014 and this was again the result in the 2015 survey. This is to be expected based on the fact that woodland patches are scattered and do not provide suitable habitat for possums at present.

4.3 Pest species

Four introduced vertebrate species (other than sheep and cattle) that have been previously identified in the ML area and surrounding region includes: the European rabbit, European (brown) hare, House Mouse (*Mus domesticus*) and Red Fox (*Vulpes vulpes*). All species, aside from the House Mouse, were identified during the spring 2015 survey. Rabbit bait stations were set up by EBS within the ML during 2015 to assist with controlling rabbit numbers.

4.4 Rehabilitation and Revegetation

To date, Hillgrove Resources has made a positive contribution toward woodland enhancement and the planned rehabilitation of the site at the time of the mines closure. Rehabilitation operations continue to see areas of native woodland and grassland expand within the mining lease area and SEB areas.

A commercial-scale seed production area has been developed at the site, which is able to produce large quantities of local provenance native species for the re-establishment of native grassland and woodland communities within and adjacent to the mining lease. This continues to be successful with direct seeding strips and infill planting within the new SEB areas occurring in 2015.

Woodland areas in the north-west corner (previously fragmented through agricultural and grazing) have undergone revegetation to enhance the area and provide links to allow fauna to move through increased corridors. As part of SEB requirements, 130 ha within the mining lease area and in adjacent properties, are being rehabilitated.

As yet, there has been no marked increase in species diversity or abundance of the SEB areas. Over time, the SEB areas will regenerate and provide habitat similar to the ML whereby it would be expected bird guilds would be diverse as well as eventually providing habitat for fauna species such as the Common Brushtail Possum. Given that the control of pest species such as rabbit is also been targeted, a reduction of species such as Hare and European rabbit, will hopefully see less grazing pressure and increase the regeneration of rehabilitated areas.

Figure 5. Brown Treecreeper was typically recorded in woodland patches within the ML.

5 RECOMMENDATIONS

This is the fifth successive spring fauna survey completed by EBS at the Kanmantoo site. All surveys were undertaken with the aim of recording fauna species that occur within the project area. These have focused primarily on known threatened species or species that may potentially occur within the area. The purpose of the fauna survey was designed to monitor fauna activity across the site, which will allow any long term trends in populations to be determined. A long term data series continues, with some trends starting to become apparent. However a greater data set is required (five-ten years) to determine if there are any long term impacts and to remove any variance due to localised seasonal changes. The following general recommendations are listed below:

- Undertake fauna surveys during optimal spring periods (as per the long term scope of the project) to monitor the presence of conservation significant and targeted fauna species;
- Monitor Peregrine Falcon behaviour around the mine lease particularly around their breeding season between July to December to determine whether they are utilising the pit as a breeding site. This may require a single/earlier visit at the beginning of the 2016 breeding season;
- Investigate the methodology proposed within the PEPR (Coffey, 2012) with regard to monitoring Diamond Firetail within the ML and determine whether it is effective with regard to mitigation measures. Previous recommendation has been to survey the Diamond Firetail population in the ML to determine the overall population size, the number and size of Diamond Firetail flocks and the habitat use of the birds in the ML area. Conducting monthly surveys would provide a much better picture of habitat usage and population size of this species, and
- Continue the positive contribution toward planned rehabilitation, woodland enhancement and SEB programs that add to species diversity both on site and outside of the mining lease area. This can be achieved by establishing new areas of native grassland, woodland and habitat within the mining lease and SEB areas which will assist with providing potential feeding habitat for fauna species.

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EBS Ecology
3/119 Hayward Avenue
Torrensville, SA 5031
www.ebsecology.com.au
t. 08 7127 5607
f. 08 8352 1222