MIDWEST CORPORATION LIMITED

FAUNA ASSESSMENT KOOLANOOKA

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REPORT NO: 2004/40

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1. INTRODUCTION

1.1 Purpose and Scope

Midwest Corporation Limited (Midwest) proposes to mine direct shipping grade iron ore (haematite) Koolanooka for export overseas.

ATA Environmental was commissioned by Midwest to undertake a fauna survey and prepare an associated report to support the Notice of Intent for the proposed development.

The report includes:-

- a review of the Western Australian Museum database to identify potential vertebrate fauna within the area;
- a search of the Department of Conservation and Land Management's Threatened and Priority Species database to identify potential scheduled and threatened species within the region;
- a search of the Commonwealth's database of fauna of national environmental significance to identify species potentially occurring within the area that are protected under the *Environment Protection and Biodiversity Conservation Act*;
- an eight day trapping program, avifauna surveys, spotlighting surveys, hand searches and opportunistic sightings;
- comparisons with the results of a previous fauna survey undertaken at the site; and
- recommendations on measures to prevent or minimise impacts on any significant fauna.

1.2 Site Description

The study area encompasses approximately 6,400ha and is located approximately 160km south east of Geraldton and 21km east of Morawa (Figure 1).

The majority of the site consisted of the rocky/stony shallow soils associated with the rolling to very steep hills of the Koolanooka Hills, or the red loams of the alluvial valley flats. Four land systems were present in the study area: Koolanooka, Morawa, Noolagabbi and a small amount of the rolling hills associated with Mount Nunn. The distribution of the land systems within the study area is shown in Figure 2.

The study area contains a mix of cleared farming land with pockets of vegetation and scattered native trees and well vegetated areas in the Koolanooka Hills. An aerial photograph of the study area is shown in Figure 3. The vegetation in the study area is predominantly woodland dominated by Eucalypt species, or thickets dominated by *Acacia* and *Allocasuarina* species. There are limited amounts of surface water in the

area. The bottom of the mine pit contains permanent brackish water. Cattle troughs are also located within the study area.

2. METHODOLOGY

2.1 Database Searches

A regional desktop search using the Western Australian Museum database was used to develop a list of potential bird, reptile, mammal and amphibians in the project area. The regional search was bounded by 29° 00' to 30° 00'S, and 116° 00' to 117° 00'E. Other publications were also used to provide supplementary information including Tyler *et al.* (2000) for frogs, Storr *et al.* (1983, 1986, 1990 and 1999) for reptiles, Johnstone and Storr (1998) for birds and Strahan (1995) for mammals.

A search of the Department of Conservation and Land Management's Threatened and Priority Species database was undertaken to identify potential scheduled and threatened species in the region (Appendix 1).

A search of the Commonwealth *Environmental Protection and Biodiversity Conservation (EPBC) Act* 1999 on-line database was also undertaken.

These sources of information were used to create lists of species expected to occur at the site. As far as possible, expected species are those that are likely to utilise the project area, and such lists exclude species that have been recorded in the general region as vagrants or for which suitable habitat is absent. Particularly among the birds, for example, vagrants can be recorded almost anywhere.

Taxonomy and nomenclature for fauna species used in this report generally follow Aplin and Smith (2001) for amphibians and reptiles, How *et al.* (2001) for mammals and Johnstone (2001) for birds.

2.2 Trapping

An eight day fauna trapping program was conducted at Koolanooka from 15 –23 December 2003. All fauna trapping was conducted under a licence issued by the Department of Conservation and Land Management (# SF 004385) (Appendix 1). A number of reptile and mammal specimens were vouchered with the Western Australian Museum to confirm identifications.

Seven separate trapping sites were set up within the vegetated portion of the Koolanooka study area. Sites 1-5 consisted of six trapping arrays spread 30 metres apart. Each trapping array consisted of one 150 mm diameter stormwater pipe pit-traps (500 mm deep) and one 20 L bucket pit-traps alternating along a 10 m drift fence (300 mm high). Six 10m drift fences were constructed using the same pattern at each site. One cage trap and one Elliott traps were placed 10 m either side of each 10 m drift fence. Sites 6 and 7 each had three arrays of pit-traps instead of six arrays and three Elliott and three cage traps instead of six.

The location and a description of each trapping site is provided in Table 1 and shown in Figure 3.

TABLE 1
LOCATION AND DESCRIPTION OF TRAPPING SITES

	Location		Topography at Trap Site	Description of vegetation at Trap site
Site 1	50 422804 E	6770340 N	Flat	Open woodland
Site 2	50 423793 E	6769682 N	Slope	Closed heath to tall open shrubland
Site 3	50 422962 E	6771165 N	Flat	Tall closed shrubland of Acacia species
Site 4	50 422820 E	6771805 N	Slope	Tall Acacia and Allocasuarina shrubland
Site 5	50 420999 E	6770635 N	Flat	Acacia shrubland
Site 6	50 423581 E	6770532 N	Ridge	Open woodland over tall shrubland
Site 7	50 422292 E	6771524 N	Ridge	Sidewalls of mine pit

Table 2 shows the trapping effort conducted for each site. Site 1 was open for 8 nights, sites 2-6 were open for 7 nights and site 7 was open for 6 nights. A total of 1020 trap nights were conducted between Monday 15 December and Tuesday 23 December 2003.

TABLE 2.
NUMBER OF TRAP NIGHTS PER TRAPPING SITE CONDUCTED AT KOOLANOOKA

	Trap type		
Site	Pit-trap nights	Elliott trap nights	Cage trap nights
1	96	48	48
2	84	42	42
3	84	42	42
4	84	42	42
5	84	42	42
6	42	21	21
7	36	18	18
TOTAL	**510**	**255**	**255**

2.3 Avifauna surveys

Systematic avifauna surveys were conducted each morning between Tuesday 16 and Friday 19 for three person hours and opportunistically throughout the whole survey period (15-23 December). All birds were identified by their call or direct observation.

2.4 Spot-lighting Survey

Spot-lighting targets a particular suite of fauna, such as nocturnal reptiles that do not readily get caught by other means (e.g. Pythons).

Spot-lighting was conducted on five evenings. Spot-lighting was conducted from a slow moving vehicle (less than 10 km/hr) using head torches and a high powered hand-held spot light. Each survey lasted approximately 2.5 hrs and included each trapping site. The distance covered was approximately 20km.

2.5 Hand Searches

Hand searching was conducted at each trapping site for 3 person hours. This included digging out holes, removing bark from logs and trees and sorting through leaf litter with rakes.

2.6 Invertebrates

Although most work focussed on vertebrate species, specimens of mygalomorph spiders, scorpions, centipedes, land snails and isopods were collected opportunistically. These were targeted because within these groups, many species are known to have restricted distributions and the groups are therefore rich in short-range endemics, often associated with relictual and fragmented habitats such as the ironstone ranges in the Murchison. In addition, the expertise exists to identify species within these groups, whereas such expertise is not readily available for most other invertebrate taxa.

2.7 Survey Staff

Scott Thompson (ATA Environmental) and Chris Clemente, both qualified zoologists, conducted the fauna survey with assistance from Ryan Phillips, Sean Tomlinson and Sean Stankowski.

3. RESULTS

3.1 Avifauna

Bird species that may occur at the site and observed during the survey period are listed in Appendix 2. Based on the results of the database searches, a total of 152 species of birds may potentially occur at the site. However it is unlikely all 152 species would occur at the site due to an absence of specific micro habitat requirements or the seasonal nature of the species. The disadvantage of lists of predicted species is that, in the process of covering all eventualities, an area can appear to have a more diverse fauna than is actually the case.

Fifty-seven species were observed during the survey period.

3.2 Reptiles, Amphibians and Mammals

Reptile, amphibian and mammal species expected to occur at Koolanooka and observed during the survey are listed in Appendices 3 and 4.

The regional desktop search of the Western Australian Museum database identified 63 species of reptiles, and 28 species of mammals (5 introduced or feral) may be present at Koolanooka, however, not all of these species will be necessarily present on site because of the absence of specific micro habitat requirements.

Twenty-six species of reptiles, and twelve species of mammals, including six introduced species were observed during the fauna survey.

3.3 Invertebrates

Although this survey was directed towards developing an understanding of the vertebrate fauna of the study area, some invertebrates were also collected. This collection was confined to groups where the technical expertise exists to enable identification to be carried out, and to groups that are known for their abundance of short-range endemics. These are species with restricted distributions that are often associated with mesic refugia such as rocky hills in the Murchison. Groups that were collected included mygalomorph spiders, isopods (slaters), scorpions, land snails and centipedes. Millipedes also include short-range endemic species, but no millipedes were encountered during the survey.

Specimens have been lodged with the WA Museum but identifications are not yet available.

3.4 Species potentially occurring within the study area identified as being of National Environmental Significance under the EPBC Act 1999

Four threatened species of fauna and 35 migratory species of birds potentially occurring within the Koolanooka area were highlighted as having national

environmental significance under the *Environment Protection and Biodiversity Conservation* Act 1999. These species are listed in Table 3.

TABLE 3
SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA IDENTIFIED AS HAVING NATIONAL ENVIRONMENTAL SIGNIFICANCE UNDER THE EPBC ACT 1999

Threatened Species	Status	Type of Presence
Birds		
Acanthiza iredalei iredalei Slender-billed Thornbill (western sub-species)	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Egernia stokesii badia Western Spiny-tailed Skink	Endangered	Species or species habitat likely to occur within area

Migratory Species	Status	Type of Presence
Birds		
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Migratory	Species or species habitat likely to occur within area
Malleefowl *Leipoa ocellata*	MIGRATORY	Species or species habitat likely to occur within area
Brown Goshawk *Accipiter fasciatus*	Migratory	Species or species habitat likely to occur within area
Collared Sparrowhawk *Accipiter cirrhocephalus cirrhocephalus*	Migratory	Species or species habitat likely to occur within area
Wedge-tailed Eagle *Aquila audax audax*	Migratory	Species or species habitat likely to occur within area
Little Eagle *Aquila morphnoides*	Migratory	Species or species habitat likely to occur within area
Spotted Harrier *Circus assimilis*	Migratory	Species or species habitat likely to occur within area
Black-shouldered Kite *Elanus axillaris*	Migratory	Species or species habitat likely to occur within area
Whistling Kite *Haliastur sphenurus*	Migratory	Species or species habitat likely to occur within area
Square-tailed Kite *Lophoictinia isura*	Migratory	Species or species habitat likely to occur within area
Grey Teal *Anas gracilis gracilis*	Migratory	Species or species habitat likely to occur within area
Pacific Black Duck *Anas superciliosa*	Migratory	Species or species habitat likely to occur within area
Hardhead *Aythya australis*	Migratory	Species or species habitat likely to occur within area
Australian Wood Duck *Chenonetta jubata*	Migratory	Species or species habitat likely to occur within area
Black Swan *Cygnus atratus*	Migratory	Species or species habitat likely to occur within area
Pink-eared Duck *Malacorhynchus membranaceus*	Migratory	Species or species habitat likely to occur within area
Freckled Duck *Stictonetta naevosa*	Migratory	Species or species habitat likely to occur within area
Australian Shelduck	Migratory	Species or species habitat likely to

Migratory Species	Status	Type of Presence
Tadorna tadornoides		occur within area
Black Fronted Dotterel *Charadrius melanops*	Migratory	Species or species habitat likely to occur within area
Hooded Plover *Charadrius rubricollis*	Migratory	Species or species habitat likely to occur within area
Red-capped Plover *Charadrius ruficapillus*	Migratory	Species or species habitat likely to occur within area
Red-kneed Dotterel *Erythrogonys cinctus*	Migratory	Species or species habitat likely to occur within area
Inland Dotterel *Peltohyas australis*	Migratory	Species or species habitat likely to occur within area
Banded Lapwing *Vanellus tricolor*	Migratory	Species or species habitat likely to occur within area
Brown Falcon *Falco berigora berigora*	Migratory	Species or species habitat likely to occur within area
Australian Hobby *Falco longipennis*	Migratory	Species or species habitat likely to occur within area
Peregrine Falcon *Falco peregrinus*	Migratory	Species or species habitat likely to occur within area
Nankeen Kestrel *Falco cenchroides cenchroides*	Migratory	Species or species habitat likely to occur within area
Banded Stilt *Cladorhynchus leucocephalus*	Migratory	Species or species habitat likely to occur within area
Black-winged Stilt *Himantopus himantopus*	Migratory	Species or species habitat likely to occur within area
Red-necked Avocet *Recurvirostra novaehollandiae*	Migratory	Species or species habitat likely to occur within area
Fork-tailed Swift *Apus pacificus pacificus*	Migratory	Species or species habitat likely to occur within area
Rainbow Bee-eater *Merops ornatus*	Migratory	Species or species habitat likely to occur within area

3.5 Significant Fauna under the WA Wildlife Conservation Act 1950-1979

In Western Australia, all native fauna species are protected under the *Wildlife Conservation Act 1950-1979*. Fauna species that are considered rare, threatened with extinction or have a high conservation value are specially protected under the Act. In addition, some species of fauna are covered under the 1991 ANZECC convention, while certain birds are listed under the Japan and Australian Migratory Bird Agreement (JAMBA) and the China and Australian Migratory Bird Agreement (CAMBA).

Classification of rare and endangered fauna under the Wildlife Conservation (Specially Protected Fauna) Notice 1998 recognises four schedules of taxa. These are;

Schedule 1 – fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection.

Schedule 2 – fauna which are presumed to be extinct and are declared to be fauna in need of special protection.

Schedule 3 – birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction which are declared to be fauna in need of special protection; and
Schedule 4 – fauna that are in need of special protection, otherwise than for the reasons mentioned in Schedule 1, 2 or 3.

In addition to the above classification, CALM also classify fauna under four different Priority codes:

Priority one – Taxa with few, poorly known populations on threatened lands. Taxa which are known from few specimens or sight records from one of a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened species.

Priority two – Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands no under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority three – Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority four – Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could if present circumstances change. These taxa are usually represented on conservation lands. Taxa which are declining significantly but are not yet threatened.

3.6 Species Listed as Threatened or Priority Species under *Wildlife Conservation Act* 1950 Potentially Occurring at Koolanoka

Threatened and priority species listed under the *Wildlife Conservation Act* that may potentially occur at Koolanooka are listed in Table 4 and described in Sections 3.6.1 – 3.6.3 of this report.

TABLE 4
SPECIES POTENTIALLY OCCURING AT KOOLANOOKA THAT ARE LISTED AS THREATENED OR PRIORITY SPECIES UNDER THE WILDLIFE CONSERVATION ACT

Species	Status
Malleefowl (*Leipoa ocellata*)	S1
Western Spiny-tailed Skink (*Egernia stokesii badia*)	S1
Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*)	S1
Tree Stem Trapdoor Spider (*Aganippe castellum*)	S1
Minnivale Trapdoor Spider (*Teyl* sp.)	S1
Cyclodomorphus branchialis	P2
Hooded Plover (*Charadrius rubricollis*)	P4

3.6.1 Descriptions of Species listed as Schedule 1 – Fauna that are Rare or likely to become Extinct

Malleefowl (*Leipoa ocellata*) – Malleefowl are large, ground-dwelling birds that rarely fly unless alarmed. Historically the Malleefowl has been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Recently the range has contracted, but Malleefowl are still found throughout these regions in fragmented patches. Malleefowl build distinctive nests that comprise a large mound of soil/rock covering a central core of leaf litter. These nest mounds range in diameter but on average span more than five metres and may be up to one metre high. They are generally monogamous and once breeding begins, pair for life.

Malleefowl are opportunistic feeders and will eat whatever food sources are locally or seasonally abundant. They are omnivorous and their diet may include foliage, fruits, flower buds and seeds of a diverse range of plants as well as invertebrates, and sugary lerps, tubers and fungi. Although the Malleefowl will drink if water is available, it normally lives without it. Clearing of habitat for agriculture, increased fire frequency, competition with exotic herbivores (sheep, rabbits, cattle, goats) and kangaroos, predation by foxes and cats, inbreeding as a result of fragmentation and possibly hunting for food in marginal populations are all threatening processes. Habitat clearing in agricultural areas has increased the risk of local extinction. The habitat in the project area is suitable for Malleefowl and the CALM records show that three observations have been made in the area in the past.

Western Spiny-tailed Skink (*Egernia stokesii badia*) – This species occurs in semi-arid scrubs and woodlands of Shark Bay and the northern wheatbelt, sheltering in hollow logs and behind the bark of fallen trees. Twelve records have been made since 1929 in the region.

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) - This species inhabits the southwest of WA. Its preferred habitat is the woodland where it preferentially feeds on plants of the Proteaceae family. In winter, flocks can be found in heaths. It is likely to be a seasonal visitor to the study area.

Tree Stem Trapdoor Spider (*Aganippe castellum*) – This species lives in summer dry bogs prone to irregular flooding and builds a characteristic burrow entrance against a tree stem. Records in surrounding areas suggest that this species could possibly occur in the area in question.

Minnivale Trapdoor Spider (*Teyl* sp.) – This species is only known from a few locations. Records in surrounding areas suggest that this species could possibly occur in the study area.

3.6.2 Descriptions of Species listed as Priority 2 - Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands

Cyclodomorphus branchialis is a medium sized skink found in semi-arid scurbs on heavy soils. It has a restricted distribution in the south-west Murchison and the project area is at the eastern limit of its range.

3.6.3 Descriptions of Species listed as Priority 4– Taxa in need of monitoring

Hooded Plover (*Charadrius rubricollis*) – This species frequents the margins and shallows of salt lakes, also along coastal beaches, where it forages for invertebrates along the water's edge. It is found along the southern coasts and salt lakes north to Port Gregory, Three Springs, Mt Gibson, Lake Brown, Lake Barlee, Lake Cowan and Eyre, and including Rottnest Island. It is uncommon to common resident on the southern sea beaches from Cape Naturalist east to Eyre. It is scarce to common throughout the rest of its distribution.

3.7 Migratory Species listed under the *Environmental Protection and Biodiversity Conservation Act* 1999

White-bellied Sea Eagle (*Haliaeetus leucogaster*) – This species is the second largest bird of prey found in Australia. White-bellied Sea-Eagles are a common sight in coastal and near coastal areas of Australia. Birds form permanent pairs that inhabit territories throughout the year. Their loud "goose-like" honking call is a familiar sound, particularly during the breeding season. Birds are normally seen, perched high in a tree, or soaring over waterways and adjacent land. In addition to Australia, the species is found in New Guinea, Indonesia, China, south-east Asia and India. The White-bellied Sea-Eagle feeds mainly off aquatic animals, such as fish, turtles and sea snakes, but it takes birds and mammals as well. It is a skilled hunter, and will attack prey up to the size of a swan. Sea-Eagles also feed on carrion (dead prey) such as sheep and fish along the waterline. They harass smaller birds, forcing them to drop any food that they are carrying. Sea-Eagles feed alone, in pairs or in family groups.

White-bellied Sea-Eagles build a large stick nest, which is used for many seasons in succession. The nest can be located in a tree up to 30m above the ground, but may be also be placed on the ground or on rocks, where there are no suitable trees. At the start of the breeding season (May to October), the nest is lined with fresh green leaves and twigs. The female carries out most of the incubation of the two white eggs, but the male performs this duty from time to time.

Brown Goshawk (*Accipiter faciastus*) – This species is also called the Australian Goshawk. It inhabits most of Australia, where ever there are trees, water and food. Adults live in pairs and have permanent territories, but the young wander widely. Brown Goshawks may be found from desert water holes to scrub and ash forest and from mountain ranges to timbered foothills. The diet is mainly small mammals and birds, reptiles and large insects. They usually attack prey on the ground and if available the Brown Goshawk will also eat rabbits, pigeons and poultry. The nesting season ranges from Spring to early Summer and the nest is a rough platform of sticks and twigs, lined with green eucalyptus leaves, high in a tree. It may be refurbished and used again in subsequent seasons. The usual clutch of two or three eggs incubates after 35 days. The young fledge after another 5 weeks in the nest. The female undertakes incubation and most of the care of the young, assisted by the male who regularly brings food to the vicinity of the nest.

Collared Sparrowhawk (*Accipiter cirrhocephalus cirrhocephalus*) – This species is commonly seen in the Perth area. It favours woodlands, watercourses and farmland but is often seen flying over residential areas. It flies with long glides broken by fast wing beats, and are stealthy hunters, hiding in the foliage of trees and attacking with swift, chasing flights. Prey is usually smaller birds, occasionally taking insects and reptiles. The Collared Sparrowhawk is Australia's smallest raptor, with males weighing half that of females. When breeding, the female incubates and broods young, using food brought by the male to feed each chick equally. Young birds molt from the juvenile plumage straight to adult plumage. They are distributed Australia wide.

Wedge-tailed Eagle (*Aquila audax audax*) – This species is Australia's largest living bird of prey and one of the largest eagles in the world. The Wedge-tailed Eagle has long wings, a characteristic long, wedge-shaped tail, and legs that are feathered all the way to the base of the toes. The Wedge-tailed Eagle is found throughout mainland Australia, Tasmania and southern New Guinea, from sea level to alpine regions in the mountains. It prefers wooded and forested land and open country, generally avoiding rainforest and coastal heaths. Eagles can be seen perched on trees or poles or soaring overhead to altitudes of up to 2000 m.

Wedge-tailed Eagles build their nest in a prominent location with a good view of the surrounding countryside. It may be built in either a live or dead tree, but usually the tallest one in the territory. In some parts of Australia, where tall trees are absent, small trees, shrubs, cliff faces or even the ground may be used. The nest is a large structure of dead sticks, usually reused for years, often reaching considerable size. The Wedge-tailed Eagle is the most common of the world's large eagles. It is nonetheless affected by several human activities. It has

benefited by the opening of forests in eastern Australia and the increased availability of rabbits. Wedge-tailed Eagles however, are sensitive to forestry operations. In the more arid zones, extensive clearing has reduced the nesting resources. If a Breeding pair are disturbed when they are preparing to lay eggs, they may abandon the nest. Indirect poisoning through Dingo baits and pesticides continues to be a major hazard. Wedge-tailed Eagles are monogamous and apparently mate for life. If one bird of a pair is killed, the survivor will find a new mate.

Little Eagle (*Aquila morphnoides*) – This medium-sized raptor is commonly found along the coastal plain and Darling Scarp, in woodlands, scrublands, farming and along watercourse areas. Little Eagles soar on flat wings at heights of up to 100m, searching for rabbits, lizards and small birds. Once prey has been spotted, the hunter will descend in a series of sharp, vertical drops and catch it. The Little Eagle is often seen flying singly over grasslands and woodlands around Perth. It is found Australia wide excluding Gibson Desert, Tasmania and Cape York tip.

Spotted Harrier (*Circus assimilis*) – This species is a large raptor especially adapted to feeding on the dry, open grass plains of inland Australia. It has a round face and forward facing eyes that make it a superb and precise hunter. They feed on small mammals, birds, reptiles and insects snatched by surprise attacks with it's long, elegant legs. The Spotted Harrier is easily distinguished from other raptors by it's long, broad tail and white spotted underparts. It is found Australia wide excluding northern and eastern coasts.

Black-shouldered Kite (*Elanus axillaris*) – This species is a small bird of prey that live in woodlands, grasslands, paddocks and city parks over most of Australia. They are pale grey in colour with a white head and black shoulder patch. They have red eyes, sharp, hooked beaks and feet with three toes facing forwards and one toe facing backwards. Black-shouldered Kites call with a hoarse wheezing sound. Black-shouldered Kites sit in tall dead trees or fly high above the ground in the early morning and late afternoon looking for mice, lizards, snakes, frogs and insects. When they find a prey item they drop silently onto it and grab it in their sharp talons, killing it quickly. They tear their prey into pieces with their sharp beak and swallow it. Black-shouldered Kites make nests high up in the trees from a loose cup of sticks and leaves. Females lay three to four white eggs, which have red-brown blotches.

Whistling Kite (*Haliastur sphenurus*) – This species is found in the better watered regions, including continental islands south to Barrow Island; casual on Bernier Island and in arid eastern highlands (south to Warburton and Cavenagh Ranges) and is a vagrant elsewhere in Western Australia It inhabits lightly to moderately densely wooded country, especially near water (including mangroves) and is attracted to road kills, grass fires, rabbit warrens, breeding colonies of wetland birds, slaughter yards and occasionally salt-work ponds. It is very common in the south and east Kimberley flatlands, common in the Pilbara and Gascoyne regions and south-western farmlands, otherwise scarce to moderately common. In the south-west is largely confined to wooded wetlands but can also be found in farming areas.

Square-tailed Kite (*Lophoictinia isura*) – This species is a solitary hunter, flying close to the tree canopy in search of prey. It feeds on small birds, insects and reptiles picked from the outer foliage of trees and on nestlings and eggs of tree nesting birds. The Square-tailed Kite forms permanent pairs that defend a territory. Nests are reused yearly with adults lining the nest with fresh leaves daily. The Square-tailed Kite is considered a rare visitor to the Perth area. It inhabits most of Australia excluding some patchy absence and Tasmania.

Grey Teal (*Anas gracilis gracilis*) – This species is one of the smaller Australian ducks, measuring 40cm - 48cm (males larger than females). Both sexes are similar in plumage. Grey Teals are common in all sheltered watered areas throughout Australia. These include fresh, brackish and salt water, and the birds can be found on the smallest area of water in the driest of areas. The most favoured habitat type is timbered pools and river systems of the inland areas, where these Teal can be found in quite large numbers. During periods of drought, birds are very mobile in search of water, often traveling great distances. Grey Teals feed in small to large flocks. Food consists of a variety of types and includes dry land plants, aquatic plants, seeds, crustaceans, and insects and their larvae. Feeding methods are also varied. Birds may dabble (filter surface water or mud through the bill), upend and feed from the bottom, or graze from the surface of the water on plant material.

Pacific Black Duck (*Anas superciliosa*) – This species measures 50 to 60 cm in length. Pacific Black Ducks are usually seen in pairs or small flocks and readily mix with other ducks. In the wild, birds are often very wary of humans and seldom allow close approach. Birds in urban ponds become quite tame, however. The Pacific Black Duck is one of the most versatile of the Australian ducks. It frequents all types of water, from isolated forest pools to tidal mudflats, and is found in all but the most arid regions of Australia. Outside Australia, its range extends throughout the Pacific region. It is mainly vegetarian, feeding on seeds of aquatic plants. This diet is supplemented with small crustaceans, molluscs and aquatic insects. Food is obtained by 'dabbling', where the bird plunges its head and neck underwater and upends, raising its rear end vertically out of the water. Occasionally, food is sought on land in damp grassy areas.

Hardhead (*Aythya australis*) – This species, also known as the White-eyed Duck, is mainly found near fresh or brackish waters, including rain freshened salt lakes and farm dams, but rarely salty water. It mainly breeds in the south-west, but ranges to most well-water regions, but is a vagrant in the arid east and on Rottnest Is. It is rare to uncommon and usually in ones and twos or small flocks. It is most plentiful in the Kimberley and south-west (i.e. Swan Coastal Plain).

Australian Wood Duck (*Chenonetta jubata*) – This species is also known as the Maned Goose, as its scientific name means "maned goose-duck". It is found throughout he year at natural and decorative lakes, gardens, golf courses and large grassed areas. In winter, they are sparse, usually only breeding pairs, but in summer they will congregate in large numbers. They will walk far from water to graze, and when startled fly directly to the nearest waterbody. An urgent need to bath follows, as well as continuous calling from members of the group. When

grazing, a sentry keeps a watchful eye out for any possible threats from other birds, people and especially dogs. Wood Ducks have a very strong bond, and both males and females will chase away other Wood Ducks from their mate, with hissing and with head lowered. Nests are always in tree hollows, as they are from the family of "Perching Ducks", with around 10 creamy eggs. Adults care for young until they are fully fledged and sometimes, they family groups will stay together for months after. Wood Ducks are found across all of Western WA and eastern NT and SA. All of NSW, QLD, VIC and TAS.

Black Swan (*Cygnus atratus*) – This species is found throughout Australia with the exception of Cape York Peninsula, and are more common in the south. They prefer larger salt, brackish or fresh waterways and permanent wetlands, requiring 40 m or more of clear water to take off. Outside the breeding season, Black Swans travel quite large distances. Birds fly at night and rest during the day with other swans. The Black Swan has been introduced into several countries, including New Zealand, where it is now common, and is a vagrant to New Guinea. The Black Swan is a vegetarian. Food consists of algae and weeds, which the bird obtains by plunging its long neck into water up to 1 m deep. Occasionally birds will graze on land, but they are clumsy walkers. In the north, the Black Swan breeds from February to May, with June to September preferred by birds in the south. Birds form isolated pairs or small colonies in shallow wetlands. Birds pair for life, with both adults raising one brood per season. Up to ten eggs are laid in an untidy nest made of reeds and grasses. The nest is placed either on a small island or floated in deeper water. The chicks are covered in grey down, and are able to swim and feed themselves as soon as they hatch.

Pink-eared Duck (*Malacorhynchus membranaceus*) – This species is not well identified by it's name, as the small pink patches around the ear holes, are at most times, not visible. It is more noticeable for its large bill, with flaps of flesh on the tip, which are used to syphon very small particles of food from the water, in the same way as the shovellers. They eat freshwater algae, microscopic animals, plants and small seeds. Breeding depends on major local flooding, and there is no regular cycle, but it times the hatching of it's chicks for when the waters are receding, when there is a build up of insect life to feed the ducklings. After a long period of drought, there can be a huge concentration of breeding ducks, as pairs take the opportunity to produce young, and do so prolifically. In usual breeding situations, Pink-Eared Ducks will usually produce 5 to 7, creamy white eggs, in a nest of down, inside a hollow tree. They are found Australia wide excluding Gibson Desert.

Freckled Duck (*Stictonetta naevosa*) – This species is one of Australia's rarest ducks. They are easily distinguished from other small dark ducks by the white speckled plumage, and when breeding the male's bright red skin above the bill. The Freckled Duck prefers thickly vegetated swamps. It is found in the south-west of WA, . southwest QLD extending to western NSW, VIC and eastern SA.

Australian Shelduck (*Tadorna tadornoides*) – This species was formerly called the 'Mountain Duck', which was deceivable as it prefers coastal saline lakes rather than mountainous streams. Pairs are closely bonded and will chase away other shelducks with hisses. The nest is sometimes a hollow in a tree far above the ground, and may be a great distance from water. After all the chicks are hatched, the parents call to the chicks, which leap from the tree hollow and are lead to water. The Australian Shelduck is common around Perth's lakes (natural and man-made). They will also visit farm and pastoral land with dams, and golf courses. It inhabits central and western WA, south east SA extending to NSW, VIC and TAS.

Black Fronted Dotterel (*Charadrius melanops*) – This species, also known as the Black-fronted Plover, is found across most of Western Australia, except for the Great Sandy Desert, Great Victoria Desert, Nullarbor Plain and far south-west. It is mainly found around the margins of fresh or brackish water, however, small (river pools, lagoons, claypans, swamps, rock holes, ephemeral waters, roadside puddles).Occasionally found on the edge of salt lakes and estuaries. It is sedentary in favourable locations but nomadic in drier parts of its range.

Hooded Plover (*Charadrius rubricollis*) – This species frequents the margins and shallows of salt lakes, also along coastal beaches, where it forages for invertebrates along the water's edge. It is found along the southern coasts and salt lakes north to Port Gregory, Three Springs, Mt Gibson, Lake Brown, Lake Barlee, Lake Cowan and Eyre, and including Rottnest Island. It is uncommon to common resident on the southern sea beaches from Cape Naturalist east to Eyre. It is scarce to common throughout the rest of its distribution.

Red-capped Plover (*Charadrius ruficapillus*) – This species is found along coasts and coastal plains, including many islands off the west and south coasts. It is also found in better-well watered parts of the interior (except the Kimberley) and is a casual visitor in the arid interior. Most of the time it can be found along sandy beaches and adjacent sand dunes, estuarine flats, shores of salt lakes and salt pans and shores of fresh waters (rivers, claypans, river pools, drying swamps, dams). It is moderately common to common and can be found in large congregations along Eighty Mile Beach towards the end of the dry season.

Red-kneed Dotterel (*Erythrogonys cinctus*) – This species, also known as the Red-kneed Plover, is found across much of the state, especially well-watered flatlands in arid and semiarid zones. It inhabits mainly shallow and muddy margins of fresh and brackish waters (swamps, claypans, lakes, sewerage ponds, inundated samphire and bore overflows) and is rarely found in river pools and salt ponds. It is nomadic and seasonally and locally common but generally rare to uncommon.

Inland Dotterel (*Peltohyas australis*) – This species, also known as the Australian Dotterel, is found throughout much of the arid and semi-arid interior, north to the middle Ashburton River, Lake Disappointment and Warburton Range, but not sandy deserts. It mainly inhabits sparsely vegetated stony plains, samphire flats, dry claypans, ploughed fields, stubbles and leys in wheat belt. It is a sedentary bird that is scarce to common across its range.

Banded Lapwing (*Vanellus tricolor*) – This species, also known as the Banded Plover, is found in the southern and central regions, north to Roebourne, Roy Hill and the Gibson Desert, but is absent from heavily wooded areas in the semi-arid interior. It inhabits the sparsely wooded country with low open ground cover (especially near fresh water), including chenopod flats, short grass flats, bare margins of wetlands and granite outcrops, farmlands, playing fields, airports and bare ground around stock watering holes. It is partly migratory, tending to leave cooler regions and move northwards in autumn. It is scarce to common (most numerous in the wheatbelt and southern parts of Gascoyne regions) and is usually found in ones and twos. It has greatly expanded its range this century.

Brown Falcon (*Falco berigora berigora*) – This species is a small to medium-sized raptor. The Brown Falcon is normally silent at rest, but gives some cackling and screeching notes when in flight. Paler birds may often be confused with the Nankeen Kestrel, *F. cenchroides*, which is quite a bit smaller and has a more rufous crown. The Brown Falcon ranges throughout Australia, and north to New Guinea. It is found in all but the densest forests and is locally common throughout its range. The preferred habitat is open grassland and agricultural areas, with scattered trees or structures such as telegraph poles which it uses for perching. Around outback towns, the birds become quite tame and will allow quite close approach. Birds may stay within the same areas throughout the year or may move around locally in response to changes in conditions. Paler birds are normally associated with inland areas, but all the colour varieties are fairly scattered throughout the range. Brown Falcons are normally seen alone, searching for food from an exposed perch. When prey is sighted, the bird swoops down and grasps it in its claws (talons). Less often the species will hunt by hovering or gliding over the ground, often at great heights. Brown Falcons feed on small mammals, insects, reptiles and, less often, small birds.

Australian Hobby (*Falco longipennis*) – This species spends its summers resident in Australia and in winter it migrates to New Guinea and Moluccas area. It is most usually found in wooded country, preferably humid, but may occur also in semi-desert. A woodland or forest-loving falcon, it is fairly common and well distributed in suitable localities throughout Australia, but is more common in moister woodlands, which appear to be its preferred habitat. It is not usually found in open plains. The Australian Hobby's diet consists mainly of small birds up to the size of a quail, occasionally parakeets or pigeons. They also eat large insects and bats when disturbed in daylight. In play it will stoop at much larger birds such as bustards and herons, but it is not able to overcome birds of this size.

Peregrine Falcon (*Falco peregrinus*) – This species is found across most of Australia, but only occurs in low densities and has a wide and patchy distribution. It favours hilly or mountainous country and open woodlands and may be an occasional visitor to the study area. It is also a Schedule 4 species under the WA Wildlife Act 1950.

Nankeen Kestrel (*Falco cenchroides cenchroides*) – This species is a slender falcon. Nankeen Kestrels are found in most areas of Australia, but tend to be absent

from dense forests. The preferred habitats are lightly wooded areas and open agricultural regions. Birds are also found on islands along Australia's coastline, as well as New Guinea and Indonesia. The Nankeen Kestrel's success as a bird of prey can be largely contributed to its tolerance for a wide variety of habitats and its ability to feed on a variety of foods and nest in a range of sites. Some birds are partially migratory, others disperse in response to the availability of food and some are largely resident. Extensive surveys placed the Nankeen Kestrel in the top ten most commonly seen birds; it was recorded in 95% of the survey sites located across the whole of Australia. The Nankeen Kestrel's diet is varied. It mainly feeds on small mammals, reptiles, small birds and a variety of insects. Prey is located from a perch or by hovering a short distance above the ground on rapid wing-beats, using its fan-shaped tail as a rudder and keeping the head and body kept still. Once prey is spotted, the bird drops nearer to the ground until it is close enough to pounce. Some insects and birds may be caught in mid-air or snatched from tree branches. The Nankeen Kestrel nests in a wide variety of sites, including tree hollows, caves, ledges on the outside of buildings and occasionally on the ground. The nest consists of anything from a simple scrape in the dirt of a ledge or tree hollow, to a nest of sticks or mud that has been abandoned by another species of bird. Pairs of Nankeen Kestrels usually stay together over successive breeding seasons, and will often use the same nest site or territory year after year.

Banded Stilt (*Cladorhynchus leucocephalus*) – This species is patchily distributed across the arid, semiarid and subhumid wetlands north to 20 °S and east to 123 °E, including Rottnest Island. It is found mainly on salt lakes (including salt work ponds) and estuaries, also fresh and brackish lakes and swamps. It is a nomadic or migratory bird spending off-season on permanent lakes, mostly on coastal plains and in the south-western interior, moving after heavy rains between late summer and early winter to breeding range, but not necessarily nesting each year. It usually occurs in large flocks.

Black-winged Stilt (*Himantopus himantopus*) – This species, also known as the White-headed Stilt or Pied Stilt, is found in the better-watered parts of Western Australia, but not the north-west and central Kimberley, Darling Range or far south-west. It is casual visitor else. It inhabits shallow open fresh or brackish waters, swamps, lagoons, claypans, rain-freshened samphire flats and salt lakes, floodwaters, river pools, dams and sewerage and mining ponds. It is also found on salt lakes and estuaries. It is a nomadic bird, and common in well-watered flat lands; common in wet years in drier parts of its range but generally scarce to moderately common. Usually found in ones and twos, but occasionally in large flocks.

Red-necked Avocet (*Recurvirostra novaehollandiae*) – This species has a strange upturned bill of the which serves as an important utensil to stir and detect prey. It feeds in the shallows of wetlands and lakes, for tiny aquatic insects, worms and crustaceans, also molluscs. Unlike the Black-winged Stilt, the Red-necked Avocet has partially webbed feet enabling it to swim. They have a patchy distribution over most of Australia.

Fork-tailed Swift (*Apus pacificus pacificus*) – This species breeds in the north-east and mid-east Asia and winters in Australia and south New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara and Eucla in November and in the south-west land division in mid-December, and leaving by late April. It is common in the Kimberley; uncommon to moderately common near north-west, west and south-east coasts; rare to scarce elsewhere. Usually in flocks (up to 2000), sometimes accompanying Tree Martins and Masked Woodswallows. They are attracted to thunderstorms and often appear before and after cyclones

Rainbow Bee-eater (*Merops ornatus*) – This species is found across the better-watered parts of Western Australia including islands. It prefers lightly wooded, preferably sandy country near water. It is a resident, breeding visitor, postnuptial nomad, passage migrant and winter visitor. Wintering from the Gascoyne north to Indonesia. It moves south mainly in late September and early October and north from February to April. It is scarce to very common across its range.

3.8 Species Potentially Occurring at Koolanooka listed under the EPBC Act 1999 but not the *Wildlife Conservation Act*

One species, the Slender-billed Thornbill (*Acanthiza iredalei iredalei* is listed under the Environmental Protection and Biodiversity Conservation Act as a species of national environmental significance but is not included under the *Wildlife Conservation Act*. This species is sparsely distributed across arid and semi-arid southern Western Australia and western South Australia from the west coast south of Carnarvon to the east coast of Spencer Gulf and east of the Flinders Ranges. It occupies treeless chenopod shrublands and favours saline flats associated with salt lakes. The Slender-billed Thornbill populations are under threat because of habitat reduction due to sheep grazing and ringbarking of trees by rabbits. It is unlikely that this species will occur in the study area (Listed as Vulnerable).

3.9 Other Significant Species not listed under the *Environmental Protection and Biodiversity Conservation Act* 1999 or the *Wildlife Conservation Act*, 1950.

Three species that may potentially occur at Koolanooka are considered to have conservation significance but are not listed under the *Environmental Protection and Biodiversity Conservation Act* 1999 or the *Wildlife Conservation Act*, 1950. A brief description of each of the species is provided below.

Carpet Python (*Morelia spilota imbricata*) – This species is widespread within the southwest, but is not in high density across its distribution. It is unlikely that this species will occur in the study area (Schedule 4 under the WA Wildlife Act).

Woma Python (*Aspitdites ramsayi*) – This species is a found across central Australia into the southwestern edge of Queensland, and into northern South Australia. Other populations are known from the Pilbara coast, north to the Eighty-mile Beach area, and south-west Western Australia, from Cape Peron south and east

to the eastern Goldfields. It occurs in the arid zones of Western Australia, favouring open myrtaceous heath on sandplains, and dunefields dominated by spinifex.

The Woma is a nocturnal, terrestrial python that shelters in hollow logs, animal burrows or thick vegetation during the day. It is a dietary generalist and will eat all kinds of terrestrial vertebrates including small mammals, ground birds and lizards. It is distinguished from other Australian pythons in possessing a narrow head rather than a broad head distinct from the body. The last confirmed siting in the region was at Watheroo in 1989, but there have also been unconfirmed observations near Coorow within the last 3 years (Schedule 4 under the WA Wildlife Act).

Bush Stone-curlew (*Burhinus grallarius*) – This species is a large, slim, mainly nocturnal ground-dwelling bird. It is regarded as uncommon or rare throughout the region having declined as a result of feral cats and foxes. It can be found in open wooded country or scrubs, among many other habitats. When sited it will normally crouch down or stand perfectly still and rely on camouflage to disguise it. When approached, it will normally walk away rather than fly (especially during the day).

They have a wide-ranging diet, but prefer to feed on insects, molluscs, small lizards, seeds and occasionally small mammals. Feeding takes place at night and all food is taken from the ground. Although regionally present, it is unlikely to be found in the study area (Priority 4 under the WA Wildlife Act).

3.10 Significant fauna Recorded from the Study Area.

3.10.1 Western Spiny-tailed Skinks

Ten Western Spiny-tailed Skinks (*Egernia stokesii badia*) were found in two colonies during the 2003 fauna survey. The Western Spiny tailed Skink is listed as a Schedule 1 species under the *Wildlife Conservation Act* 1950 and as an Endangered species under the *Environmental Protection and Biodiversity Conservation Act*, 1999. The first colony was found just outside the study area (50 408658 E, 6771444 N) under tin and rubbish near a farmhouse. Six females, one male and one dead skink were found. The second colony of two skinks (one male and one unsexed) was found within the study area near a second farmhouse (50 418990 E, 6771550 N). The second colony was located under tin and in a large hollow Eucalypt tree.

The two colonies of Western Spiny-tailed Skinks were found in degraded areas with tin and abandoned car bodies surrounding farmhouses, which were surrounded by Large Eucalypts and considerable amounts of dead wood lying on the ground. Most of the Eucalypts and logs are hollow which provide ideal habitat for the Western Spiny-tailed Skinks. The individuals that were captured were found under tin and other rubbish, which are easily hand searched. It is possible both colonies were larger than found during the hand searching as there are many hollow trees and branches that could not be adequately hand searched.

No other colonies were found in the study area and there were limited suitable habitats available to sustain more colonies. All other tip sites and car dumps were searched in the study area.

3.10.2 Malleefowl

Six inactive Malleefowl mounds were located within the study area (Table 5 and Figure 3). However, all six mounds were inactive and there was no evidence of Malleefowl being present within the study area during the 2003 fauna survey. The Malleefowl is listed as a Schedule 1 species under the *Wildlife Conservation Act* and has the status of Vulnerable under the *Environmental Protection and Biodiversity Conservation Act.* It is also listed as a Migratory species under the *Environmental Protection and Biodiversity Conservation Act.*

TABLE 5
LOCATION OF INACTIVE MALLEEFOWL MOUNDS FOUND IN THE KOOLANOOKA AREA.

Mound 1	50 426807	6766147
Mound 2	50 425468	6766955
Mound 3	50 426161	6767198
Mound 4	50 422960	6771182
Mound 5	50 426325	6765126
Mound 6	50 424114	6768735

3.10.3 Other significant species found

A number of Migratory species listed under the *Environmental Protection and Biodiversity Conservation Act* were observed in the study area including the Brown Goshawk, Wedge-tailed Eagle, Spotted Harrier, Australian Shelduck, Brown Falcon, Nankeen Kestrel, Tree Martin, Welcome Swallow, and Rainbow Bee-eater.

It is unlikely the mining activity will substantially modify, destroy or isolate an area of important habitat of any of these migratory species, or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significantly proportion of the population of any of the species.

No other species of significant fauna were recorded during the fauna survey.

4. CONCLUSION AND RECOMMENDATIONS

The fauna survey of the Koolanooka area had a relatively low species, with a total of 95 species observed during the survey. Fifty-seven species of birds (one introduced), twenty six species of reptiles and twelve species of mammals (six introduced) were observed during the survey.

Koolanooka is surrounded by cleared land used for agriculture with a number of species of introduced fauna, which may account for the lower than expected faunal diversity

Although there was a low species diversity, the site provides habitat for one colony of *Egernia stokesii badia*. This skink is listed as Schedule 1 under the *Wildlife Conservation Act* 1950 and Endangered under the *Environment Protection and Biodiversity Conservation Act*, 1999. A second colony of skinks is located just outside the project area. Neither population will be impacted by the proposed iron ore project and associated infrastructure.

The preferred management strategy for conserving the two colonies of *Egernia stokesii badia* is to de-stock cattle and sheep surrounding the colonies and limit access of vehicles and people. It is also suggested that the area is fenced and a fox baiting and cat trapping program is continued (or started).

A number of inactive Malleefowl mounds were located within the study area but there was no evidence of Malleefowl being present within the study area.

A number of Migratory species listed under *the Environmental Protection and Biodiversity Conservation Act* were observed in the study area including the Brown Goshawk, Wedge-tailed Eagle, Spotted Harrier, Australian Shelduck, Brown Falcon, Nankeen Kestrel, Tree Martin, Welcome Swallow, and Rainbow Bee-eater. It is unlikely the mining activity will substantially modify, destroy or isolate an area of important habitat of any of these migratory species, or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significantly proportion of the population of any of the species.

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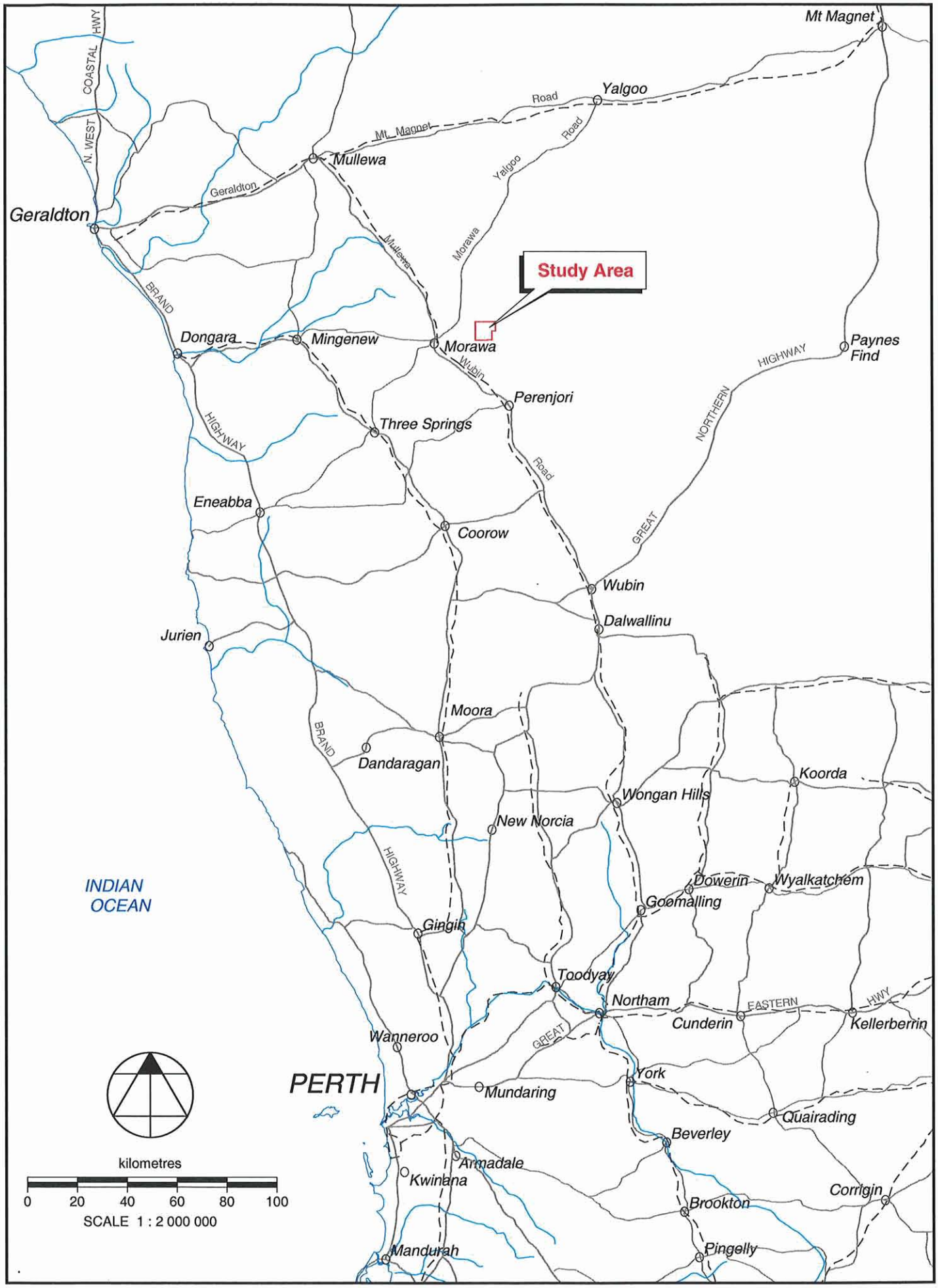
FIGURES



PRINTED: Tue 25 May 04 CHECKED BY: MS 24-3-04 DRAWN BY: EDS 22-03-04 DATUM: AMG MIS-2003-001/KOOL/NOI/24_40f1.dgn

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FAUNA ASSESSMENT, KOOLANOOKA

REGIONAL LOCATION

FIGURE 1

PRINTED: Wed 24 Mar 04

CHECKED BY: MS

DRAWN BY: EDS/GLM 23-03-04

DATUM: MGA

2003-MIS-001/KOOL/NOI/24_40F2.dgn

metres

0 500 1000 1500 2000

SCALE 1 : 30 000

LEGEND

Boundary of Study Area

Cadastral Boundary

Soil Landscape Systems Boundary

Soil Landscape Systems Legend

Bo	Bowgarder	Undulating rises and gently inclined slopes of calcareous gradational loams and shallow rocky soils.
Ko1 Ko2	Koolanooka	Range of rolling to very steep low hills with gently inclined footslopes. Rocky soil with gradational red gravelly loams. Ko1 and Ko2 subsystems.
Mn1	Mount Nunn	Range of rolling to steep low hills with rocky crests and long gently inclined sandy footslopes. Shallow rocky and sandy duplex soils on hilly country with gradational yellowish red sandy soils on the footslopes. Mn1 and Mn2 subsystems.
Mw1	Morawa	Gently undulating low rises and ridges. Gradational red sandy loam, stony sands on granite and minor areas of yellow sand over ironstone gravel. Mw1 and Mw2 subsystems.
Ng1 Ng2	Noolagabbi	Level to very gently inclined flats and lower slopes found at the base of broad valleys, often associated with saline drainage network. Red sands, loams and clays over a red brown hard pan. Ng1, Ng2, Ng3, Ng4 and Ng5 subsystems.
Pi1	Pindar	Gently undulating sand plain with long gentle slopes. Moderate to deep yellow acidic sands with areas of gradational sands on ferruginous gravel and gritty sands on granite. Pi1, Pi2, Pi3 and Pi4 subsystems.

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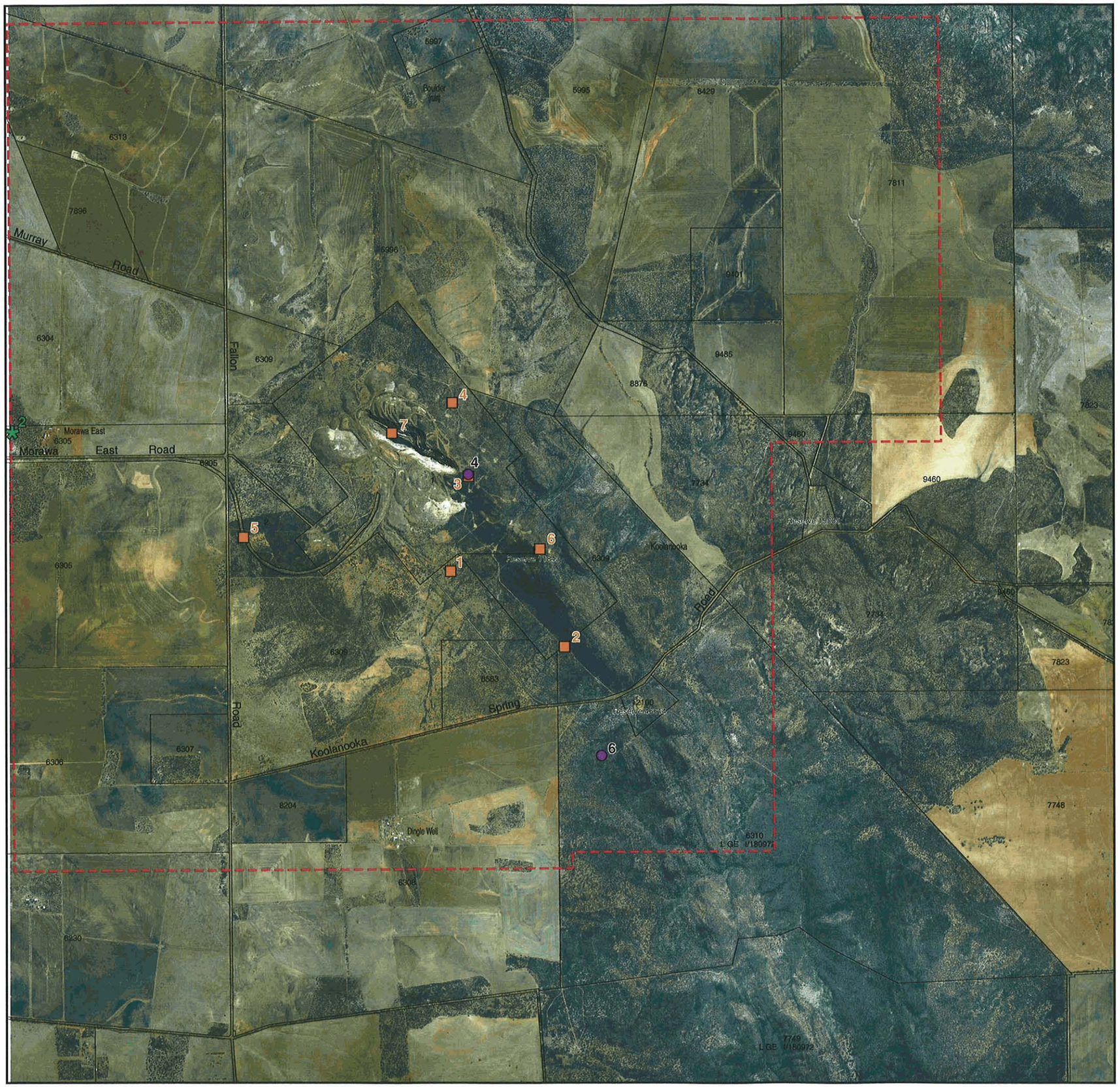
FAUNA ASSESSMENT, KOOLANOOKA

LAND RESOURCES AT KOOLANOOKA

FIGURE 2

SOURCE: Geraldton Region Sheet 2, Land Resource Map No. 14/2, Natural Resources Assessment Group, 1996.



BASE SOURCE: AAM Hatch, 3-10-04

metres

0 500 1000 1500 2000

SCALE 1 : 35 000

LEGEND

- Boundary of Study Area
- Cadastral Boundary
- 6 Trap Site (7 Sites)
- 4 Inactive Malleefowl Mound (2 Mounds)
- 2 Western Spiny Tailed Skink Colony (1 Colony)

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FAUNA ASSESSMENT, KOOLANOOKA

LOCATIONS OF TRAPPING SITES & INACTIVE MALLEEFOWL MOUNDS

FIGURE 3

PRINTED: Tue 25 May 04

CHECKED BY: MS 24-3-04 DRAWN BY: EDS/GLM 24-3-04 DATUM: MGA

MIS-2003-001/KOOL/NOI/24_40F3.dgn

PLATE

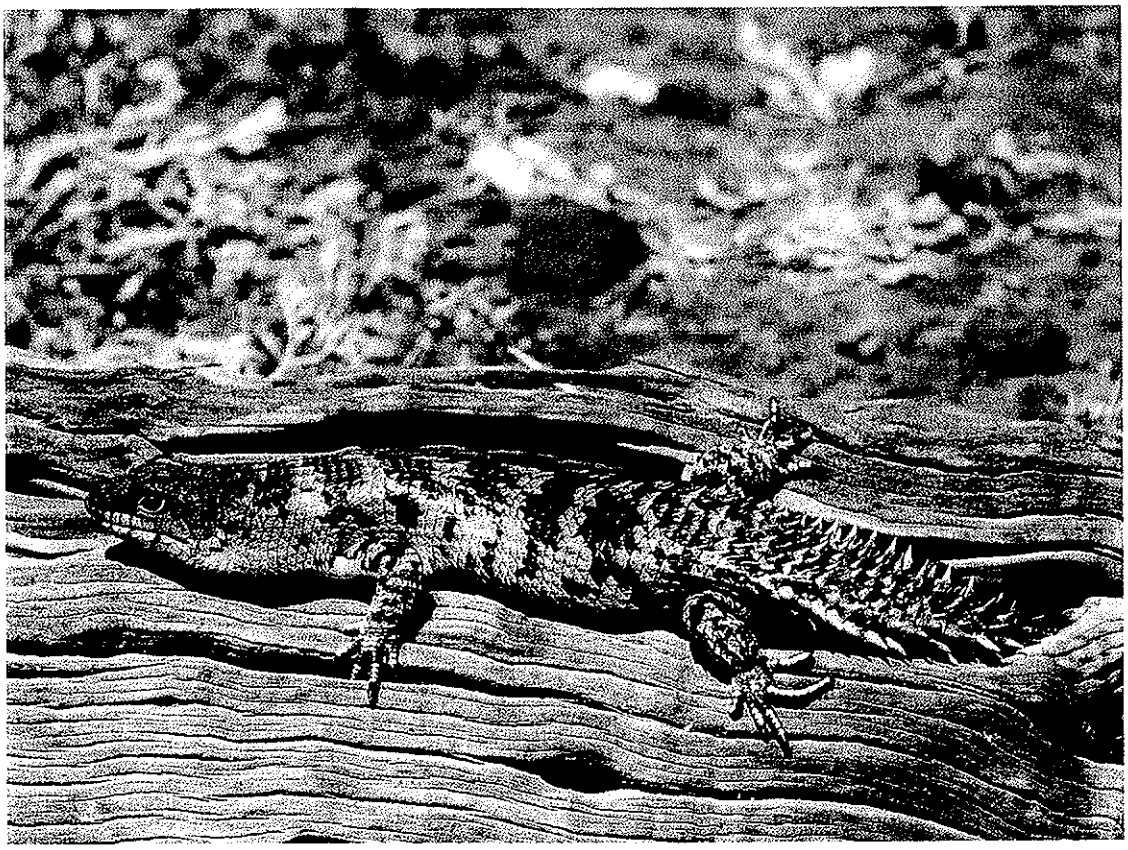

Plate 1 - Western Spiny Tailed Skink - *Ergenia strokessi badia*

APPENDICES

APPENDIX 1

RESULTS OF CALM FAUNA DATABASE SEARCH AND FAUNA LICENCE

Your Ref:
Our Ref: 2001F001096V06
Enquires: Christine Freegard
Phone: (08) 9334 0579
Fax: (08) 9334 0278
Email: christinef@calm.wa.gov.au

DEPARTMENT OF
Conservation
AND LAND MANAGEMENT
Conserving the nature of WA

Mr Scott Thompson
ATA Environmental
2 Bulwer St
PERTH WA 6000

Dear Mr Thompson

REQUEST FOR THREATENED FAUNA INFORMATION

I refer to your request of 19 November for information on threatened fauna occurring at Koolanooka.

A search was undertaken for this area of the Department's Threatened Fauna database, which includes species which are declared as '*Rare or likely to become extinct* (Schedule 1)', '*Birds protected under an international agreement* (Schedule 3)', and '*Other specially protected fauna* (Schedule 4)'. Attached are print outs from these databases where records were found.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the sixth point that refers to the requirement to undertake field investigations for the accurate determination of threatened fauna occurrence at a site. The information supplied should be regarded as an indication only of the threatened fauna that may be present.

An invoice for $110.00 (includes GST), being the set charge for the supply of this information, will be forwarded.

It would be appreciated if any populations of threatened fauna encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss threatened fauna management, please contact my Senior Zoologist, Dr Peter Mawson on 08 93340421.

Yours sincerely

Freegard

.....

for Keiran McNamara
ACTING EXECUTIVE DIRECTOR

20 November, 2003

Attachment

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

THREATENED FAUNA INFORMATION

Conditions In Respect Of Supply Of Information

* All requests for data to be made in writing to the Executive Director, Department of Conservation and Land Management, Attention: Senior Zoologist, Wildlife Branch.

* The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided without the prior consent of the Executive Director, Department of Conservation and Land Management.

* Specific locality information for Threatened Fauna is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for Threatened Fauna may not be used in reports without the written permission of the Executive Director, Department of Conservation and Land Management. Reports may only show generalised locations or, where necessary, show specific locations without identifying species. The Senior Zoologist is to be contacted for guidance on the presentation of Threatened Fauna information.

* Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data, they may be present. The Department of Conservation and land Management accepts no responsibility for this.

* Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.

* It should be noted that the supplied data do not necessarily represent a comprehensive listing of the Threatened Fauna of the area in question. Its comprehensiveness is dependent of the amount of survey carried out within a specified area. The receiving organisation should employ a biologist/zoologist, if required, to undertake a survey of the area under consideration.

* Acknowledgment of the Department of Conservation and Land Management as the source of data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Conservation and Land Management, Attention; Senior Zoologist, Wildlife Branch.

29 °S 116.5 °E / 29.5 °S 116 °E Koolanooka

*	Date	Certainty	Seen	Location Name	Method

Schedule 1 - Fauna that is rare or is likely to become extinct

Leipoa ocellata — Malleefowl — *3 records*

This species was once widely distributed across southern Australia. It prefers woodland or shrubland with an abundant litter layer that provides essential material for the construction of its nest mound.

1988	1			
1996	1			Day sighting
1996	1			Day sighting

Egernia stokesii badia — Western Spiny-tailed Skink — *12 records*

This species occurs in semi-arid scrubs and woodlands of Shark Bay and the northern wheatbelt, sheltering in hollow logs and behind bark of fallen trees.

1929	1	1	Morawa	Caught or trapped
1934	1	1	Morowa	Caught or trapped
1937	1	1	Bowgada	Caught or trapped
1937	1	1	Bowgada	Caught or trapped
1998	1	1		Caught or trapped
1998	1	1		Scats
1998	1	1		Bones
1998	1	1		Caught or trapped
1998	1	1	Bowgada NR	Caught or trapped
1998	1	1	Morowa	Caught or trapped
1998	1	5	Perenjori	Caught or trapped
1998	1	1	West Perenjori NR	Caught or trapped

Aganippe castellum — Tree Stem Trapdoor Spider — *0 records*

This species lives in summer dry bogs prone to irregular flooding and builds a characteristic burrow entrance against a tree stem. Records in surrounding areas suggest that this species could possibly occur in the area in question.

Teyl sp (BY Main 1953/2683, 1984/13) — Minnivale Trapdoor Spider — *0 records*

This species is only known from a few locations. Records in surrounding areas suggest that this species could possibly occur in the area in question.

Schedule 4 - Other specially protected fauna

0 records

Priority One

29 °S 116.5 °E / 29.5 °S 116 °E

*	*Date*	*Certainty*	*Seen*	*Location Name*	*Method*

0 records

Priority Two

0 records

Priority Three

0 records

Priority Four

0 records

* Information relating to any records provided for listed species:-
Date: date of recorded observation
Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.
Seen: Number of individuals observed.
Location Name: Name of reserve or nearest locality where observation was made
Method: Method or type of observation

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Enquiries: 17 DICK PERRY AVE, KENSINGTON, WESTERN AUSTRALIA
Telephone: 08 9334 0333
Facsimile: 08 9334 0242

Correspondence: **Locked Bag 30**
Bentley Delivery Centre WA 6983

DATE OF ISSUE 21/11/2003
DATE OF EXPIRY 25/12/2003
VALID FROM 14/12/2003

LICENSING OFFICER

LICENSEE: MR S THOMPSON (SCOTT)
ADDRESS: ATA ENVIRONMENTAL
2 BULWER ST.,
PERTH WA 6000

- - - - - - - - - - - - - - - - - -

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Enquiries: 17 DICK PERRY AVE, KENSINGTON, WESTERN AUSTRALIA
Telephone: 08 9334 0333
Facsimile: 08 9334 0242

Correspondence: **Locked Bag 30**
Bentley Delivery Centre WA 6983

RECEIPT NO. **AMOUNT** $0.00

WILDLIFE CONSERVATION ACT 1950
REGULATION 17
LICENCE TO TAKE FAUNA FOR SCIENTIFIC PURPOSES

THE UNDERMENTIONED PERSON MAY TAKE FAUNA FOR RESEARCH OR OTHER SCIENTIFIC PURPOSES AND WHERE AUTHORISED, KEEP IT IN CAPTIVITY, SUBJECT TO THE FOLLOWING AND ATTACHED CONDITIONS, WHICH MAY BE ADDED TO, SUSPENDED OR OTHERWISE VARIED AS CONSIDERED FIT.

EXECUTIVE DIRECTOR

CONDITIONS

1 THE LICENSEE SHALL COMPLY WITH THE PROVISIONS OF THE WILDLIFE CONSERVATION ACT AND REGULATIONS AND ANY NOTICES IN FORCE UNDER THIS ACT AND REGULATIONS.

2 UNLESS SPECIFICALLY AUTHORISED IN THE CONDITIONS OF THIS LICENCE OR OTHERWISE IN WRITING BY THE EXECUTIVE DIRECTOR, SPECIES OF FAUNA DECLARED AS LIKELY TO BECOME EXTINCT, RARE OR OTHERWISE IN NEED OF SPECIAL PROTECTION SHALL NOT BE CAPTURED OR OTHERWISE TAKEN.

3 NO FAUNA SHALL BE TAKEN FROM ANY NATURE RESERVE, WILDLIFE SANCTUARY, NATIONAL PARK, MARINE PARK, TIMBER RESERVE OR STATE FOREST WITHOUT PRIOR WRITTEN APPROVAL OF THE EXECUTIVE DIRECTOR. NO FAUNA SHALL BE TAKEN FROM ANY OTHER PUBLIC LAND WITHOUT THE WRITTEN APPROVAL OF THE GOVERNMENT AUTHORITY MANAGING THAT LAND.

4 NO ENTRY OR COLLECTION OF FAUNA TO BE UNDERTAKEN ON ANY PRIVATE PROPERTY OR PASTORAL LEASE WITHOUT THE CONSENT IN WRITING OF THE OWNER OR OCCUPIER, OR FROM ANY ABORIGINAL RESERVE WITHOUT THE WRITTEN APPROVAL OF THE DEPARTMENT OF INDIGENOUS AFFAIRS.

5 NO FAUNA OR THEIR PROGENY SHALL BE RELEASED IN ANY AREA WHERE IT DOES NOT NATURALLY OCCUR, NOR HANDED OVER TO ANY OTHER PERSON OR AUTHORITY UNLESS APPROVED BY THE EXECUTIVE DIRECTOR, NOR SHALL THE REMAINS OF SUCH FAUNA BE DISPOSED OF IN SUCH MANNER AS TO CONFUSE THE NATURAL OR PRESENT DAY DISTRIBUTION OF THE SPECIES.

6 THIS LICENCE AND THE WRITTEN PERMISSION REFERRED TO AT CONDITIONS 3 & 4 MUST BE CARRIED BY THE LICENSEE OR AUTHORISED AGENT AT ALL TIMES FOR THE PURPOSE OF PROVING THEIR AUTHORITY TO TAKE FAUNA WHEN QUESTIONED AS TO THEIR RIGHT TO DO SO BY A WILDLIFE OFFICER, ANY OTHER STATE OR LOCAL GOVERNMENT EMPLOYEE OR ANY MEMBER OF THE PUBLIC.

7 **********ANY INTERACTION INVOLVING GAZETTED THREATENED FAUNA THAT MAY BE HARMFUL AND/OR INVASIVE MAY REQUIRE APPROVAL FROM THE COMMONWEALTH GOVERNMENT DEPARTMENT, "ENVIRONMENT AUSTRALIA", PHONE 02 6274 1111. INTERACTION WITH SUCH SPECIES IS CONTROLLED BY THE COMMONWEALTH GOVERNMENT'S "ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999" & "ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION REGULATIONS 2000" AS WELL AS CALM'S WILDLIFE CONSERVATION ACT & REGULATIONS.**********

8 NO BIOPROSPECTING INVOLVING THE REMOVAL OF SAMPLE AQUATIC AND TERRESTRIAL ORGANISMS (BOTH FLORA AND FAUNA) FOR CHEMICAL EXTRACTION AND BIOACTIVITY SCREENING IS PERMITTED TO BE CONDUCTED WITHOUT SPECIFIC WRITTEN APPROVAL BY THE EXECUTIVE DIRECTOR OF C.A.L.M.

9 FURTHER CONDITIONS (NUMBERED 1 TO 10) ARE ATTACHED.

PURPOSE
FAUNA SURVEY OF KOOLANOOKA

WILDLIFE CONSERVATION ACT 1950
WILDLIFE CONSERVATION REGULATIONS

Regulation 17:- Licence to Take Fauna for Scientific Purposes

FURTHER CONDITIONS (OF LICENCE NUMBER SF 4385)

1. The licensee shall ensure that all due care is taken in the capture and handling of fauna to prevent injury or mortality resulting from that capture or handling. Where traps or other mechanical means or devices are used to capture fauna these shall be inspected at regular intervals throughout each day of their use. At the conclusion of research all markers etc and signs erected by the licensee and all traps shall be removed, all pitfalls shall be refilled or capped and the study area returned to the condition it was in prior to the research/capture program. During any break in research, cage traps should be removed and pitfalls either removed, capped or filled with sand.

2. No collecting is to be undertaken in areas where it would impinge on pre-existing scientific research programs.

3. Any form of colour marking of birds or bats to be coordinated by the Australian Bird and Bat Banding Schemes.

4. Any inadvertently captured specimens of fauna which is declared as likely to become extinct, rare or otherwise in need of special protection is to be released immediately at the point of capture. Where such a specimen is injured or deceased, the licensee shall contact CALM licensing staff at Kensington (08 9334 0434) for advice on disposal. Records are to be kept of any fauna so captured and details included in the report required under further condition 6 below.

5. Prior to any renewal of this research licence the licensee shall submit a summary report outlining work conducted under this licence and work proposed for the next research period.

6. Within one month of the expiration of this licence (or at such other time or times as the Executive Director may determine) the holder shall furnish to the Executive Director [ATTENTION: WILDLIFE CLERK] a return setting out in full detail the number of each species of fauna taken during the currency of the licence, the localities where the species was/were taken and the method of handling of such fauna and disposal of specimens. A copy of any paper or report resulting from this research should be lodged in due course with the Executive Director. In the case of consultants, a list of the fauna handled, the localities involved and a copy of the interpretive data prepared should be lodged.

7. As a general rule not more than ten specimens of any one protected species shall be permanently taken from any location less than 20km apart. Where exceptional circumstances make it necessary to take large series in order to obtain adequate statistical data the collector will proceed with circumspection and justify their actions to the Executive Director in advance.

8. No fauna, whether dead or alive, may be taken out of Western Australia without the necessary export permit issued under the *Wildlife Conservation Act 1950*. It should be noted that the permit will not be issued unless the State to which the fauna is going has approved that fauna entering that State. In addition to the requirements of the Australian States, the Commonwealth controls exports overseas through Commonwealth legislation administered by the Australian Nature Conservation Agency.

9. All holotypes and syntypes and a half share of paratypes of species or subspecies permitted to be permanently taken under this licence shall be donated to the Western Australian Museum. Duplicates (one pair in each case) of any species collected which represents a significant extension of geographic range shall be donated on request to the Western Australian Museum.

10. To prevent any unnecessary collecting in this state, all specimens and material collected under the authority of this license shall, on request, be loaned to the Western Australian Museum. Also, the unused portion or portions of any specimen collected under the authority of this license shall be offered for donation to the Western Australian Museum or made available to other scientific workers if so required.

APPENDIX 2

SPECIES OF BIRDS PREDICTED AND RECORDED TO OCCUR AT KOOLANOOKA

APPENDIX 2

SPECIES OF BIRD PREDICTED AND RECORDED TO OCCUR AT KOOLANOOKA

X represents bird that were present during the survey period.
* represents an introduced species
E represents species listed under the *Environment Protection and Biodiversity Conservation Act* 1999
EM represents migratory bird species listed under the *Environment Protection and Biodiversity Conservation Act* 1999
S represents species listed on the Department of Conservation and Land Management's Scheduled Fauna list
P represents species listed on the Department of Conservation and Land Management's Priority Fauna list

Predicted Species		Recorded
Acanthizidae (Thornbills, Gerygones, Whitefaces, Wrens)		
Inland Thornbill	*Acanthiza apicalis*	X
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	X
Slender-billed Thornbill	*Acanthiza iredalei iredalei* E	
Chestnut-tailed Thornbill	*Acanthiza uropygialis*	X
Slaty-backed Thornbill	*Acanthiza robustirostris*	
Southern Whiteface	*Aphelocephala leucopsis*	X
Western Gerygone	*Gerygone fusca*	
Shy Groundwren/Heathwren	*Hylacola cauta*	
Redthroat	*Pyrrholaemus brunneus*	X
White-browed Scrubwren	*Sericornis frontalis*	
Weebill	*Smicrornis brevirostris*	X
Accipitridae (Eagles, Kites, Hawks, Bustards)		
Brown Goshawk	*Accipiter fasciatus* EM	X
Collared Sparrowhawk	*Accipiter cirrhocephalus cirrhocephalus* EM	
Wedge-tailed Eagle	*Aquila audax audax* EM	X
Little Eagle	*Aquila morphnoides* EM	
Spotted Harrier	*Circus assimilis* EM	X
Black-shouldered Kite	*Elanus axillaris* EM	
White-breasted Sea Eagle	*Haliastur leucogaster* EM	
Whistling Kite	*Haliastur sphenurus* EM	
Square-tailed Kite	*Lophoictinia isura* EM	
Aegothelidae (Owlet-nightjars)		
Australian Owlet-nightjar	*Aegotheles cristatus cristatus*	
Anatidae (Ducks, geese, swans)		
Grey Teal	*Anas gracilis gracilis* EM	
Pacific Black Duck	*Anas superciliosa* EM	
Hardhead	*Aythya australis* EM	
Australian Wood Duck	*Chenonetta jubata* EM	
Black Swan	*Cygnus atratus* EM	
Pink-eared Duck	*Malacorhynchus membranaceus* EM	
Freckled Duck	*Stictonetta naevosa* EM	
Australian Shelduck	*Tadorna tadornoides* EM	X
Anhingidae (Darters)		
Darter	*Anhinga melanogaster*	

Apodidae (Swifts)		
Fork-tailed Swift	*Apus pacificus pacificus* EM	
Ardeidae (Herons, Egrets, Bitterns)		
White-faced Heron	*Ardea novaehollandiae novaehollandiae*	
White-necked Heron	*Ardea pacifica*	
Artamidae (Woodswallows)		
Black-faced Woodswallow	*Artamus cinereus*	X
Little Woodswallow	*Artamus minor*	X
Masked Woodswallow	*Artamus personatus*	
Burhinidae (Stone-curlews)		
Bush Stone-curlew	*Burhinus grallarius* P	
Campephagidae (Cuckoo-shrikes, Cicadabirds, Trillers)		
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	X
White-winged Triller	*Lalage tricolor*	
Casuariidae (Emus)		
Emu	*Dromaius novaehollandiae novaehollandiae*	X
Caprimulgidae (Nightjars)		
Spotted Nightjar	*Eurostopodus argus*	X
Charadriidae (Plovers, Dotterels, Lapwings)		
Black Fronted Dotterel	*Charadrius melanops* EM	
Hooded Plover	*Charadrius rubricollis* P4 EM	
Red-capped Plover	*Charadrius ruficapillus* EM	
Red-kneed Dotterel	*Erythrogonys cinctus* EM	
Inland Dotterel	*Peltohyas australis* EM	
Banded Lapwing	*Vanellus tricolor* EM	
Cinclosomatidae (Quail-thrushes, whipbirds)		
Chestnut Quail-thrush	*Cinclosoma castanotus*	
Chestnut-breasted Quail-thrush	*Cinclosoma castaneothorax*	
Columbidae (Doves, Pigeons)		
Crested Pigeon	*Ocyphaps lophotes*	X
Common Bronzewing	*Phaps chalcoptera chalcoptera*	X
Laughing Turtle-Dove	*Streptopelia senegalensis* *	
Corvidae (Crows, Ravens)		
Little Crow	*Corvus bennetti*	X
Australian Raven	*Corvus coronoides*	X
Cracticidae (Magpies, Currawongs, Butcherbirds)		
Pied Butcherbird	*Cracticus nigrogularis*	X
Australian Magpie	*Cracticus tibicen*	X
Grey Butcherbird	*Cracticus torquatus torquatus*	
Grey Currawong	*Strepera versicolor*	
Cuculidae (Cuckoos)		
Horsfield's Bronze Cuckoo	*Chrysococcyx basalis*	

Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	
Black-eared Cuckoo	*Chrysococcyx osculans*	
Pallid Cuckoo	*Cuculus pallidus*	
Dicaeidae (Mistletoes)		
Mistletoebird	*Dicaeum hirundinaceum hirundinaceum*	
Dicruridae (Drongos, Fantails, Willie Wagtails, Flycatchers)		
Magpie Lark	*Grallina cyanoleuca*	X
Grey Fantail	*Rhipidura fuliginosa*	
Willie Wagtail	*Rhipidura leucophrys leucophrys*	X
Falconidae (Falcons, Hobbys, Kestrels)		
Brown Falcon	*Falco berigora berigora* EM	X
Australian Hobby	*Falco longipennis* EM	
Peregrine Falcon	*Falco peregrinus* EM	
Nankeen Kestrel	*Falco cenchroides cenchroides* EM	X
Halcyonidae (Wood Kingfishers, Kookaburras)		
Laughing Kookaburra	*Dacelo novaeguineae novaeguineae*	
Red-backed Kingfisher	*Todiramphus pyrrhopygia*	
Sacred Kingfisher	*Todiramphus sanctus sanctus*	
Hirundinidae (Swallows, Martins)		
Fairy Martin	*Petrochelidon ariel*	
Tree Martin	*Petrochelidon nigricans nigricans*	X
Welcome Swallow	*Hirundo neoxena*	X
White-backed Swallow	*Cheramoeca leucosternus*	
Laridae (Gulls, Terns, Noddys, Skuas)		
Gull-billed Tern	*Sterna nilotica*	
Whiskered Tern	*Sterna hybrida*	
Maluridae (Emu-wrens, Fairy-wrens, Grass-wrens)		
Blue-breasted Fairy Wren	*Malurus pulcherrimus*	
Splendid Fairy-wren	*Malurus splendens splendens*	X
Variegated Fairy-wren	*Malurus lamberti lamberti*	X
White-winged Fairy-wren	*Malurus leucopterus leucopterus*	X
Megapodiidae (Malleefowl, Scrubfowl)		
Malleefowl	*Leipoa ocellata* E S	
Meliphagidae (Honeyeaters, Chats, Friarbirds)		
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	
Red Wattlebird	*Anthochaera carunculata*	X
Pied Honeyeater	*Certhionyx variegatus*	X
Black Honeyeater	*Certhionyx pectoralis*	
Orange Chat	*Epthianura aurifrons*	X
Crimson Chat	*Ephthianura tricolor*	X
White-fronted Chat	*Epthianura albifrons*	
White-eared Honeyeater	*Lichenostomus leucotis leucotis*	X
Yellow-plumed Honeyeater	*Lichenostomus ornatus*	
Grey-fronted Honeyeater	*Lichenostomus plumulus*	
Singing Honeyeater	*Lichenostomus virescens*	X
Brown Honeyeater	*Lichmera indistincta indistincta*	
Yellow-throated (White-rumped) Miner	*Manorina flavigula*	X
White-fronted Honeyeater	*Melithreptus brevirostris leucogenys*	X
Brown-headed Honeyeater	*Melithreptus brevirostris*	
	Phylidonyris albifrons	
Meriopidae (Bee-eaters)		

Rainbow Bee-eater	*Merops ornatus* EM	X
Motacillidae (Pipits, True Wagtails)		
Richard's Pipit	*Anthus novaeseelandiae*	X
Neosittidae (Sitellas)		
Varied Sittella	*Daphoenositta chrysoptera*	
Otididae (Bustards)		
Australian Bustard	*Ardeotis australis*	
Pachycephalidae (Bellbirds, Shrike-thrushes, Whistlers)		
Grey Shrike-thrush	*Colluricincla harmonica*	X
Crested Bellbird	*Oreoica gutturalis*	X
Rufous Whistler	*Pachycephala rufiventris rufiventris*	X
Golden Whistler	*Pachycephala pectoralis pectoralis*	
Pardalotidae (Pardalotes)		
Striated Pardalote	*Pardalotus striatus*	X
Passeridae (Finches, Sparrows)		
Zebra Finch	*Taeniopygia guttata*	X
Petroicidae (Flycatchers, Robins)		
Southern Scrub-robin	*Drymodes brunneopygia*	
Western Yellow Robin	*Eopsaltria australis griseogularis*	X
Hooded Robin	*Melanodryas cucullata cucullata*	
Jacky Winter	*Microeca fascinans assimilis*	
Red-capped Robin	*Petroica goodenovii*	X
Phalacrocoracidae (Cormorants)		
Little Pied Cormorant	*Microcarbo melanoleucos melanoleucos*	
Little Black Cormorant	*Phalacrocorax sulcirostris*	
Phasianidae (Quails and Pheasants)		
Stubble Quail	*Coturnix pectoralis*	
Podargidae (Frogmouths)		
Tawny Frogmouth	*Podargus strigoides*	X
Podicipedidae (Grebes)		
Hoary-headed Grebe	*Poliocephalus poliocephalus*	
Australian Grebe	*Tachybaptus novaehollandiae*	X
Pomotostomidae (Babblers)		
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	
White-browed Babbler	*Pomatostomus superciliosus*	X
Psittacidae (Pittas)		
Major Mitchell's Cockatoo	*Cacatua leadbeateri*	
Galah	*Cacatua roseicapilla*	X
Western Corella	*Cacatua pastinator*	
Little Corella	*Cacatua sanguinea sanguinea*	X
Red-tailed Black-Cockatoo	*Calyptorhynchus banksii*	X
Carnaby's Cockatoo	*Calyptorhynchus latirostris* E S	
Budgerigar	*Melopsittacus undulatus*	
Bourke's Parrot	*Neophema bourkii*	
Elegant Parrot	*Neophema elegans*	
Cockatiel	*Nymphicus hollandicus*	
Australian Ringneck	*Platycercus zonarius*	X

Regent Parrot Mulga Parrot	*Polytelis anthopeplus anthopeplus* *Psephotus varius*	X
Ptilonorhynchidae (Bowerbirds) Western Bowerbird	*Ptilonorhynchus maculatus guttatus*	
Rallidae (Coots, Crakes, Moorehens, Rails) Eurasian Coot Black-tailed Native-hen	*Fulica atra* *Gallinula ventralis*	X
Recurvirostridae (Avocets, Stilts) Banded Stilt Black-winged Stilt Red-necked Avocet	*Cladorhynchus leucocephalus* EM *Himantopus himantopus* EM *Recurvirostra novaehollandiae* EM	
Strigidae (Owls, Hawk-owls) Barking Owl Boobook Owl	*Ninox connivens* *Ninox novaeseelandiae*	
Sylviidae (Cisticolas, Grassbirds, Songlarks, Warblers) Brown Songlark Rufous Songlark	*Cincloramphus cruralis* *Cincloramphus mathewsi*	X
Threskiornithidae (Ibis and Spoonbills) Yellow-billed Spoonbill Australian White Ibis Straw-necked Ibis	*Platalea flavipes* *Threskiornis molucca* *Threskiornis spinicollis*	
Turnicidae (Button-quails) Painted Button-quail Little Button-quail	*Turnix varia varia* *Turnix velox*	
Tytonidae (Owls) Barn Owl	*Tyto alba* *Tyto alba delicatula*	
Zosteropidae (White-eyes) Silvereye	*Zosterops lateralis gouldi* *Zosterops lateralis lateralis*	

APPENDIX 3

SPECIES OF REPTILES PREDICTED AND RECORDED TO OCCUR AT KOOLANOOKA

APPENDIX 3
PREDICTED AND RECORDED REPTILE SPECIES AT KOOLANOOKA

Numbers represent the abundance of captures for each species.
Opp represents species seen opportunistically;
Scr represents scratchings;
* represents introduced or feral species.
E represents species listed under the *Environment Protection and Biodiversity Conservation Act* 1999
S represents species listed on the Department of Conservation and Land Management's Scheduled Fauna list
P represents species listed on the Department of Conservation and Land Management's Priority Fauna list

Predicted Species		Sites / Number of Captures per Species							
		1	2	3	4	5	6	7	Opp
Agamidae (Dragons)									
	Ctenophorus cristatus								
	Ctenophorus nuchalis	1							
	Ctenophorus maculatus griseus								
	Ctenophorus reticulatus	5				1			
	Ctenophorus salinarum								
	Ctenophorus scutulatus	2							1
	Moloch horridus								
Western Bearded Dragon	*Pogona minor*	1							1
	Rankinia adelaidensis								
Boidae (Pythons)									
Stimson's. python	*Antaresia stimsoni stimsoni*								1
Woma python	*Aspidites ramsayi* S								
Carpet Python	*Morelia spilota imbricata* S								
Elapidae (Elapid snakes)									
Desert Death Adder	*Acanthophis pyrrhus*								
Southern Shovel-nosed Snake	*Brachyurophis semifasciata*								

Yellow-faced Whipsnake	*Demansia psammophis reticulata*								1
Gould's snake	*Parasuta gouldii*								
Monk Snake	*Parasuta monachus*								
Mulga Snake	*Pseudechis australis*								
Ringed Brown snake	*Pseudonaja modesta*								
Gwardar	*Pseudonaja nuchalis*								1
Jan's Banded Snake	*Simoselaps bertholdi*								
Rosen's Snake	*Suta fasciata*								
Gekkonidae (Geckoes)									
	Crenadactylus ocellatus ocellatus								
	Diplodactylus granariensis								
	Diplodactylus maini								
	Diplodactylus ornatus								
	Diplodactylus pulcher	3	1		1				4
	Diplodactylus squarrosus								1
	Gehyra variegata				1	1			25+
	Heteronotia binoei		1		1		1	2	25+
	Nephrurus vertebralis								
	Oedura reticulata								
	Rhynchoedura ornata								
	Strophurus michaelseni								
	Strophurus strophurus								2
	Underwoodisaurus milii	1							3
Pygopodidae (Legless lizards)									
	Delma australis								1
	Delma grayii								
	Lialis burtonis								
	Pygopus lepidopodus								
Scincidae (Skinks)									
	Cryptoblepharus plagiocephalus								3

Ctenotus fallens								
Ctenotus mimetes	3	2						
Ctenotus pantherinus pantherinus								
Ctenotus schomburgkii								
Cyclodomorphus branchialis								1
Egernia depressa				1	3			1
Egernia inornata								
Egernia stokesii badia E								10
Eremiascincus richardsonii								
Lerista distinguenda								
Lerista gerrardii	1	1					1	
Lerista muelleri								1
Menetia greyii				1				2
Morethia butleri								1
Morethia obscura								
Tiliqua occipitalis								
Tiliqua rugosa								5
Typhlopidae (Blind snakes)								
Ramphotyphlops hamatus								
Ramphotyphlops waitii								
Varanidae (Monitors and goannas)								
Varanus caudolineatus		3						
Varanus gouldii								Scr
Varanus tristis tristis								

APPENDIX 4

SPECIES OF MAMMALS PREDICTED AND RECORDED TO OCCUR AT KOOLANOOKA

APPENDIX 4
PREDICTED AND RECORDED MAMMAL SPECIES AT KOOLANOOKA

Numbers represent the abundance of captures for each species.
Opp represents species seen opportunistically;
Scr represents scratchings;
* represents introduced or feral species.

Predicted Species	Sites / Number of Captures per Species							
	1	2	3	4	5	6	7	Opp
Bovidae (Goats, cow)								
Goat *Capra hircus* *								Scr
Canidae (Dingos. Dogs)								
Fox *Vulpes vulpes* *								1
Dasyuridae (Dunnarts, Quoll, Mardo, Wambengers)								
Fat-tailed Dunnart *Sminthopsis crassicaudata*								
Little long-tailed Dunnart *Sminthopsis dolichura*					1	1		
White-tailed Dunnart *Sminthopsis granulipes*								
Grey-bellied Dunnart *Sminthopsis griseoventer griseoventer*								
Felidae (Cat)								
Cat *Felis catus* *								2

Leporidae (Rabbits and hares)									
Rabbit	*Oryctolagus cuniculus* *								25+
Macropodidae (Wallabies, Kangaroos)									
Western Grey Kangaroo	*Macropus fuliginosus*								2
Biggada (Euro)	*Macropus robustus erubescens*								1
Red Kangaroo	*Macropus rufus*								1
Molossidae (Free-tail Bats)									
Southern Free-tail Bat	*Mormopterus planiceps*								
White-striped Free-tail Bat	*Tadarida australis*								
Muridae (Rodents)									
House Mouse	*Mus musculus* *	1							
Spinifex Hopping Mouse	*Notomys alexis*								
Mitchell's Hopping mouse	*Notomys mitchellii*								
Sandy Inland Mouse	*Pseudomys hermannsburgensis*								
Black Rat	*Rattus rattus*								1
Pteropodidae (Flying-foxes, Fruit-bats, Blossom Bats)									
Little Red Flying-Fox	*Pteropus scapulatus*								
Tachyglossidae (Echidna)									
Echidna	*Tachyglossus aculeatus*								Scr
Vespertilionidae (Evening Bats)									
Gould's Wattled Bat	*Chalinolobus gouldii*								
Chocolate Wattled Bat	*Chalinolobus morio*								
Lesser Long-eared Bat	*Nyctophilus geoffroyi*								
Greater long-eared Bat	*Nyctophilus timoriensis timoriensis*								
Inland Broad-nosed Bat	*Scotorepens balstoni*								
Inland Forest Bat	*Vespadelus baverstocki*								
Western Cave Bat	*Vespadelus caurinus*								
Finlayson's Cave Bat	*Vespadelus finlaysoni*								25+

APPENDIX 5

SECTION 18 APPROVAL TO DISTURB SITES OF ABORIGINAL SIGNIFICANCE