

KINGSTREAM RESOURCES NL

**VERTEBRATE FAUNA
KOOLANOOKA MINE SITE
MORAWA**

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TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 Purpose and Scope	1
1.2 Objectives.....	1
1.3 Location	1
2. METHODS.....	2
2.1 Fauna Habitats	2
2.2 Trapping Program.....	3
2.3 Bird Survey.....	4
2.4 Active Searching.....	4
2.5 Opportunistic Observations.....	4
2.6 Literature Review.....	5
3. VERTEBRATE FAUNA	6
3.1 Present Survey	6
3.1.1 Mammals.....	6
3.1.2 Birds.....	7
3.1.3 Reptiles	7
3.1.4 Amphibians	7
3.1.5 Distribution.....	8
3.2 Literature Review.....	9
3.3 Significant Fauna.....	9
3.3.1 Significant Mammal Species	10
3.3.2 Significant Bird Species	10
3.3.3 Significant Reptile Species.....	11
3.3.4 Significant Amphibian Species.....	11
4. DISCUSSION	12
REFERENCES	13
FIGURES	
APPENDICES	

LIST OF FIGURES

1. Regional Location of Koolanooka Mine Site
2. Location of Exploration Licence Area E70/1212
3. Koolanooka Mine Site
4. Location of Fauna Survey Sites

LIST OF APPENDICES

1. Vertebrate Fauna Recorded June 1996
2. Distribution of Vertebrate Fauna Recorded June 1996
3. Additional Vertebrate Species Expected to Occur in Habitats Within, and Adjacent to, the Study Area

1. INTRODUCTION

1.1 Purpose and Scope

Kingstream Resources NL is proposing to recommence mining operations at a former iron ore mine as part of the Mid West Iron and Steel (MWIS) project. The mine site was operated by Western Mining Corporation between 1965 and 1974 and is located near and on the Koolanooka Hills east of Morawa.

Alan Tingay & Associates has been commissioned to prepare a Notice of Intent (NOI) on behalf of Kingstream Resources NL for the proposed iron ore mine. The environmental studies required for the NOI included a vertebrate fauna survey.

This report details the results of the vertebrate fauna survey conducted within the area covered by the Exploration Licence at the former Koolanooka Iron Ore Mine.

1.2 Objectives

The primary objectives of the study were to determine the:

- vertebrate fauna present,
- distribution of the vertebrate fauna across the major habitat types available,
- presence of any rare or otherwise unusual species that may require special conservation measures, and
- regional significance of the vertebrate fauna.

1.3 Location

The former Koolanooka Iron Ore Mine is located 19km east of the Morawa town site, approximately 370km north of Perth (Figure 1). The Exploration Licence 70/1212 incorporates the old mine workings, the northern section of the Koolanooka Hills and various freehold landholdings (Figures 2 and 3). The vertebrate fauna survey encompassed the entire area included in the Exploration Licence.

2. METHODS

The survey program was designed to sample vertebrate fauna from all major habitats within the area subject to the Exploration Licence. The survey included a systematic trapping program, bird surveys, active searching and opportunistic observations. A reconnaissance survey in May 1996 enabled the identification and selection of habitats to be surveyed prior to developing the program.

The survey was conducted in June 1996 during fine and cool weather conditions.

2.1 Fauna Habitats

For the purposes of the study, 11 vegetation types within the study area, plus the old mine workings and adjacent farming land were identified as separate vertebrate fauna habitats. Some of these habitats have been modified and some areas have experienced a loss of plant diversity due to grazing by rabbits and feral goats, previous mining activities, road construction and clearing for agriculture.

The fauna habitats surveyed during the present study are detailed below. The location of survey sites 1 to 11 is indicated on Figure 4.

- Site 1. York Gum, *Eucalyptus loxophleba*, and occasional *Casuarina cristata*, 6-10m tall, 10-30% canopy cover, over mixed shrubs 1.5-2m tall, 2-10% canopy cover, over mixed shrubs, < 1m tall, 2-10% canopy cover. Leaf litter sparse < 2cm deep, scattered under shrubs. Logs and twigs abundant. Banded Ironstone slope with red loam between rocks.
- Site 2. Unstratified mixed shrubland, 1.5-2.5m tall, 70-100% canopy cover. Leaf litter sparse and clumb under shrubs, < 2cm deep, twigs and logs. Rocky hilltop.
- Site 3. *Acacia* spp. 2-4m tall, 10-30% canopy cover with emergent York Gum, *Eucalyptus loxophleba* < 5m tall, over mixed shrubs, 1-1.5m tall 2-10% canopy cover, over mixed shrubs < 0.5m tall 2-10% canopy cover. Leaf litter very sparse, occasional logs and twigs. Rocky with numerous surface boulders.
- Site 4. *Acacia* spp., *Grevillea* sp. and occasional *Hakea* sp. and Mallee 2-3m tall, 10-30% canopy cover, over seedlings of above species, 0.5-1m tall, 2-10% canopy cover, over dead grass < 0.5m tall, 10-30% canopy cover. Leaf litter, terete leaves clumped under shrubs, < 8cm deep. Soil, yellow-brown sandy loam becoming gravelly at 25cm deep.
- Site 5. Mallee and *Acacia* spp. 4-5m tall, 2-10% canopy cover, over *Grevillea* spp. 2-3m tall, 10-30% canopy cover, over shrubs 0.5-1.5m tall, 2-10% canopy cover, over dead grass < 0.5m tall, 10-30%

- canopy cover. Some sections in lower drainage areas have denser bushes to 1.5m tall. Leaf litter broad and terete leaves, clumped under shrubs to 10cm deep. Soil yellow-brown loam.
- Site 6. *Acacia* spp. 2-3m tall, 2-10% canopy cover over *Dodonaea* sp. and *Acacia* sp. 1-1.5m tall, < 2% canopy cover. Leaf litter sparse, clumped mainly terete leaves with dead shrubs and twigs. Soil stony, gravelly, loamy clay flats.
- Site 7. Mallee 3-4m tall 10-30% canopy cover and occasional *Acacia* sp., over *Grevillea* spp. and *Acacia* sp. 1-1.5m tall < 10% canopy cover, over sparse dead grass. Leaf litter clumped under mallees < 6cm deep, broad leaves, bark and twigs. Soil, red sandy loam.
- Site 8. Mallee, *Allocasuarina campestris* and *Acacia* spp. 3-5m tall 30-70% canopy cover, over *Dodonaea* sp. and *Acacia* sp. 1.5-2 m. tall 2-10% canopy cover. Leaf litter clumped < 4 cm. deep, broad leaves, twigs and logs. Soil gravel slopes with rocks.
- Site 9. York Gum, *Eucalyptus loxophleba*, 5-8m tall, 2-10% canopy cover, over *Acacia* spp., 2-4m tall, 10-30% canopy cover, over *Acacia* spp. and *Dodonaea* sp. 1.5-2m tall, 2-10% canopy cover. Mistletoe, *Amyema miquellii* is common on York Gums. Leaf litter clumped under trees and shrubs, mostly broad and terete leaves, < 5cm deep, bark twigs and numerous logs. Soil red clay loam with some pebbles.
- Site 10. Thickets, 4-6m tall, 70-100% canopy cover, over *Acacia* spp., 1-1.5m tall, < 10% canopy cover. Some areas have dead grass < 0.5m tall, 2-10% canopy cover. Leaf litter continuous, broad and terete leaves, bark and twigs < 4cm deep. Soil red clay loam with surface granite rocks and pebbles.
- Site 11. *Acacia* spp., *Melaleuca* sp. and *Allocasuarina campestris*, 2-3m tall, 30-70% canopy cover, over *Acacia* spp. 0.5-1m tall, 2-10% canopy cover. Leaf litter sparse, clumped under shrubs, mainly terete leaves < 2cm deep, old branches and logs. Rocky slope with loamy clay soil.
- Site 12. Old mine site including spoil heaps and excavated pit.
- Site 13. Farmland, with or without remnant vegetation.

2.2 Trapping Program

The survey involved both pitfall traps with drift fences and box (Elliott and Sherman) traps. A combination of trapping methods was used to maximise the potential of catching a broad range of vertebrate fauna. The trapping program was aimed at detecting reptiles and small mammals.

Sites 1 to 11 were surveyed for a period of either four or five nights. Traps were checked daily and all animals captured were identified, recorded and released immediately at point of capture. The trapping methods employed and the number of trap nights involved at each site are listed in Table 1.

TABLE 1
NUMBER OF TRAP NIGHTS FOR EACH SURVEY SITE

SITE	BOX TRAPS	PITFALL TRAPS
1	125	-
2	125	-
3	125	-
4	125	30
5	100	24
6	100	-
7	100	40
8	100	-
9	100	-
10	100	-
11	100	-
TOTAL	1200	94

2.3 Bird Survey

Bird species were systematically recorded in each habitat type daily and all individuals observed were counted. All species heard or seen were identified and recorded. In addition, all birds noted when travelling between sites were recorded. Bird species have been reported following the Royal Australasian Ornithologists Union (RAOU) nomenclature and sequence presented in Christidis and Boles (1994).

2.4 Active Searching

Several hours of active searching for vertebrate fauna species was expended at each site. Techniques included examining microhabitat refugia such as raking leaf litter, turning over rocks, examining hollow logs, digging out burrows and collecting predator scats. One hour was also spent head-torching each habitat type at night to look for nocturnal reptiles and mammals.

2.5 Opportunistic Observations

For the duration of the survey all species incidentally seen or heard within the survey area and able to be identified, were recorded. This also included evidence of species present from scats, burrows, diggings, tracks, skeletons or other signs.

2.6 Literature Review

Relevant regional literature sources concerning all vertebrate faunal groups were consulted as part of the survey. These sources provided background data which assisted in defining the zoogeography and regional significance of the vertebrate fauna in the vicinity of the study area.

The main references used to determine distribution patterns and identify species expected to occur within the study area included Kitchener and Chapman (1979) and Strahan (1995) for mammals; Blakers *et al.* (1984), Storr (1981), Dell (1979) and Dell and McGauran (1981) for birds; Chapman and Dell (1984) and Storr *et al.* (1981, 1983, 1986 and 1990) for amphibians. In addition, Dell and How (1992) was used in interpreting distributions of all vertebrate groups.

3. VERTEBRATE FAUNA

3.1 Present Survey

A total of 77 vertebrate species were recorded within the study area (including records from adjacent land) in June 1996. These comprised:

- Mammals 12 species (5 introduced)
- Birds 54 species
- Reptiles 10 species
- Amphibians 1 species

A complete list of the fauna identified during the survey is provided in Appendix 1.

All of the species recorded during the survey have widespread distributions in the semi-arid or arid regions of Western Australia. None of the species recorded is restricted to the habitat types found in the study area.

3.1.1 Mammals

Seven native and five introduced mammal species were recorded during the June 1996 survey. Two of the native species, the Western Grey Kangaroo (*Macropus fulliginosus*) and Gould's Wattled Bat (*Chalinolobus gouldii*) were only located in the adjacent farm land (Site 13) outside the Exploration Licence area.

Evidence of the Common Wallaroo (*Macropus robustus*) was found in all habitat types surveyed. This species is highly mobile and widespread throughout the study area.

The Short-beaked Echidna (*Tachyglossus aculeatus*) was present in all habitat types. Recent tracks, diggings and scats were found throughout the study area. One individual was also observed in rock crevices during the reconnaissance survey in May 1996 in the saddle between Sites 1 and 3.

Two species of bat were recorded during the survey from the area subject to the Exploration Licence. The White-striped Freetail-bat (*Nyctinomus australis*) was noted at Sites 1 and 4 as well as around the old mine workings (Site 12), while the Southern Forest Bat (*Vespadelus regulus*) was observed only around the old mine workings. The latter species was identified from skeletal remains and individuals inhabiting the old crusher.

The only native mammal captured in the traps was the Sandy Inland Mouse (*Pseudomys hermannsburgensis*). Three individuals were recorded on yellow-brown sandy loam which supports species of Acacia, Grevillea and Hakea as well as mallee (Site 4). This was the only site where this species was recorded.

Introduced species detected during the survey included the feral goat, rabbit, fox, feral cat and house mouse. The rabbit was present in all habitat types, while the feral goat was evident around rocky slopes and hilltops, and the fox was primarily detected on the plains, although this species is likely to occur

throughout. The house mouse was trapped in four habitat types including both rocky and loamy sites, on slopes or flatlands.

3.1.2 Birds

Fifty-four species of birds were recorded during the survey. These included one gazetted species and a species included on CALM's Priority Fauna List. Six species, Australian Hobby, Black-faced Cuckoo-shrike, Brown Honeyeater, Black-faced Wood Swallow, Pied Butcherbird and Australian Magpie-lark, were recorded outside the area subject to the Exploration Licence.

A freshly moulted Malleefowl (*Lelipoa ocellata*) wing feather was found at Site 8 on the eastern side of the hills, and an old nest mound is located on top of the hills near Site 2. The Malleefowl is declared "in need of special protection" (Schedule 1) under provisions of the Wildlife Conservation Act (1950).

The Spotted Nightjar (*Eurostopodus argus*) is listed on CALM's Priority Fauna List and was heard calling at night in *Eucalyptus loxophleba* Open Woodland (Site 1).

Species which appear to be widespread throughout the study area include Grey Fantail, Grey Strike-thrush, Crested Bellbird, Port Lincoln Ringneck, Weebill, Inland Thornbill, Chestnut-rumped Thornbill, Redthroat, Singing Honeyeater and Little Crow. All of these species were detected in at least 6 habitat types.

3.1.3 Reptiles

The survey identified three gecko species, one legless lizard, 5 skinks and one elapid snake. All species recorded were detected by active searching. The presence of the Mulga Snake (*Pseudechis australis*) was indicated by a sloughed skin found between rocks at Site 1.

The results suggest *Heteronotia binotii* is the most widespread of the species recorded, occurring in five habitat types within the area included in the Exploration Licence. *Lerista gerrardii* was recorded at four sites.

Due to winter hibernation and reduced reptile activity in colder periods, several reptile species are likely to have been undetected during the June 1996 survey. It is expected that a survey in spring/summer would identify a greater number of species.

3.1.4 Amphibians

Only one species of frog was recorded during the survey. *Pseudophryne occidentalis* was detected near Koolanooka Spring outside the area subject to the Exploration Licence.

3.1.5 Distribution

The survey site in which each species was observed or detected is provided in Appendix 2. A summary of the distribution of native species recorded during the June 1996 survey is as follows:

TABLE 2

NUMBER OF NATIVE SPECIES RECORDED AT EACH OF THE HABITAT TYPES SURVEYED

	SITE												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Mammals	3	2	2	4	2	2	2	2	2	2	2	4	5
Birds	19	14	11	14	6	7	11	13	20	6	9	21	23
Reptiles	6	2	1	-	-	3	1	5	2	1	2	1	1
Amphibians	-	-	-	-	-	-	-	-	-	-	-	-	1
TOTAL	28	18	14	18	8	12	14	24	24	9	13	26	30

The richest assemblage of vertebrate fauna was recorded in the land adjacent to the Exploration Licence area (Site 13). The adjacent land includes a variety of habitats such as farming land, patches of remnant vegetation, Koolanooka Spring and areas of salt marsh.

Sites dominated by *Eucalyptus loxophleba* (York Gum) recorded more diverse vertebrate fauna than most other sites. Twenty-eight species occurred at Site 1 and 24 were detected at Site 9.

The old mine workings and excavated pit (Site 12) also recorded an array of fauna with 26 species identified in this area. The permanent water in the pit contributed to the diversity recorded with several water bird species present at this site only. The old mine structures also added habitat complexity to the site providing suitable sites for species such as *Vespadelus regulus* (Southern Forest Bat) to occupy.

A greater number of native mammal species were identified at Site 1, Site 4, the old mine workings (Site 12) and the surrounding land (Site 13). Bat species were detected at Sites 1, 12 and 13 only, while the native rodent *Pseudomys hermannsburgensis* was present only on yellow-brown loamy flatland (Site 4).

The adjoining farming land and the old mine workings recorded the greatest species diversity of birds with 23 species and 21 species recorded at these sites respectively. The *Eucalyptus loxophleba* dominated habitats supported similar levels of diversity with 20 species recorded at Site 9 and 19 species identified at Site 1. Only 6 or 7 species were identified at the sites with exposed granite (Site 10) and the gravel flats (Site 6).

The rocky slopes provided a greater reptile species diversity and abundance than the other sites. Six species were identified at Site 1 and five species were located at Site 8.

The only amphibian species recorded was located at Koolanooka Spring outside the area subject to the Exploration Licence (Site 13).

The species diversity recorded at each site is not strictly comparable however, as trapping intensity and methods varied between sites. In particular, pit fall traps were operated only at Sites 4, 5 and 7.

3.2 Literature Review

An examination of relevant literature suggests that an additional 9 native mammal, 51 birds, 46 reptile and 5 amphibian species are known to occur from the region around the study area. These species are listed in Appendix 3.

All the native mammal species have widespread distributions in the southern part of Western Australia and none is known to have, or likely to have significant populations in the study area.

Most of these additional birds are nomadic or seasonal visitors to the region and would be rarely encountered in the study area as they are likely to only appear during favourable weather conditions, especially after rain.

All of the reptile species listed in Appendix 1 and most of those listed in Appendix 3 have wide distributions in the Wheatbelt of Western Australia or the adjacent semi-arid country (Chapman and Dell, 1984). Few are habitat specific and most occur in a wide range of habitat types.

Relatively few reptile species were recorded in June 1996 probably because most were in winter hibernation. Surveys in late spring would be expected to reveal many more of the species listed in Appendix 3.

The only frog species recorded has a widespread distribution in the arid regions of Western Australia. This and other frog species are rarely encountered as they spend considerable periods of time aestivating during periods of drought. After rains they appear and breed in the ephemeral pools such as those that appear temporarily at Koolanooka Spring. No amphibian species are however, expected to occur within the Exploration Licence area due to a lack of suitable habitat.

3.3 Significant Fauna

In Western Australia, rare or endangered species are protected by Schedules 1 to 4 of the Wildlife Conservation Act (1950 - amended April 1996). According to the Act, it is an offence to kill, capture or disturb any fauna listed in Schedules 1 to 4. A licence and/or ministerial permission is required prior to development in locations where gazetted species are known to occur.

Only Schedule 1 and Schedule 4 species are relevant to this study. Schedule 1 species are described as "fauna which is rare or likely to become extinct". Schedule 4 species are listed as "other specially protected fauna".

Several other species are listed by the Conservation and Land Management Department (CALM) on a Priority Fauna List, the latest of which is dated 30 April 1996. This lists fauna which either have recently been removed from the list of threatened fauna, have a restricted distribution, are uncommon and declining in range and/or abundance, or for which there is insufficient information to make an assessment of their status. Priority Fauna List species are species for which the impacts of any proposed development should be carefully considered, as there is a risk that such activities may contribute to the taxa meeting the criteria for listing as a threatened species.

3.3.1 Significant Mammal Species

None of the mammal species known or likely to occur in the study area is classified under the Wildlife Conservation Act as rare and endangered and none is listed in the CALM 1996 Priority Fauna List.

3.3.2 Significant Bird Species

- **Malleefowl *Leipoa ocellata* (Schedule 1)**

The freshly moulted wing feather located at Site 8 indicates some individuals still survive in the area, especially as there is extensive suitable habitat extending to the east away from the hills.

Although still widespread this species has become scarce as a result of predation by introduced predators such as the fox and cat. There is no evidence of a population in the section of study area likely to become part of the mining operation, and the project will therefore not affect the overall conservation status or distribution of the species.

- **Peregrine Falcon *Falco peregrinus* (Schedule 4)**

This species was considered by Storr (1991) as generally scarce or uncommon. The species is considered to have recently colonised the Wheatbelt where it now breeds in old Raven nests. It primarily occupies hilly or mountainous country and there are few records in the region. Individuals of this species are likely to occasionally visit the study area. The project will have no impact on the overall population, breeding areas, or conservation status of this species.

- **Bush Stone-curlew *Burhinus grallarius* (Priority Fauna List)**

Regarded by Storr (1991) as uncommon or rare throughout the region having declined as a result of the feral cat and fox. Blakers *et al.* (1984) list its distribution as almost Australia wide with declining populations caused by such factors as urban development, agriculture, burning and over-grazing. This species was not recorded during the survey and is unlikely to have significant populations in or adjacent to the study area. Accordingly, mining operations at Koolanooka will not affect the overall conservation status of this species.

• **Spotted Nightjar *Eurostopodus argus* (Priority Fauna List)**

Occasional individuals of this nocturnal species were recorded calling at night in the survey area. It was regarded by Storr (1991) as present throughout the region where it prefers stony country.

This species roosts and breeds on the ground and individuals may be affected by this project. However this impact will have no effect on its overall distribution or conservation status as it is presumed to be largely nomadic or a seasonal visitor in much of the South-west.

3.3.3 Significant Reptile Species

One Schedule 1 species, the Western Spiny-tailed Skink, *Egernia stokesii badia*, is known from the region of the study area but was not recorded during this survey. In the background notes to the amendments to the Wildlife Conservation Act in April 1996 it was stated that grazing by stock and a reduction in availability of logs due to altered fire regimes are believed to be the main causes of its decline.

Lack of suitable habitat (i.e. large logs) in the study area indicates that this species is unlikely to occur and this project will have no impact on its conservation status.

3.3.4 Significant Amphibian Species

None of the amphibian species known or likely to occur in the study area or adjacent land is classified under the Wildlife Conservation Act as rare or endangered or listed on CALM's Priority Fauna List.

4. DISCUSSION

The vertebrate fauna survey conducted in June 1996 identified 72 native species comprising 7 mammal, 54 bird, 10 reptile and 1 amphibian species. The survey suggested the greatest species diversity occurs on rocky slopes and in vegetation dominated by *Eucalyptus loxophleba* (York Gum).

The assessment of habitats present, the list of species recorded in June 1996, and the review of relevant literature sources show that the habitats of the study area and surrounds have the potential to support about 105 species of birds, 16 native mammals, 5 introduced mammals, 6 frogs, and 56 lizard and snake species (Appendix 1 and 3).

Zoogeographically, most vertebrate species known from the region around the study area have wide distributions throughout the Wheatbelt and adjacent semi-arid regions. This semi-arid part of Western Australia typically has vertebrate fauna that occupies a number of habitat types none of which are restricted to the region of the study area.

Most of the vertebrates recorded or expected to occur on or adjacent to the study area have been recorded on conservation reserves in the northern Wheatbelt. In particular, the East Yuna and Bindoo Hill Nature Reserves (Dell and Chapman 1981, and Dell and McGauran 1981), and the Buntine and Nugadong Nature Reserves (Dell 1979, Chapman and Dell 1979 and Klitchener and Chapman 1979). Most have also been recorded in the pastoral country to the north-east by Dell and How (1992) and are also likely to occur on the Koolanooka Hills to the south of the Exploration Licence area.

The vertebrate fauna identified at the former Koolanooka mine site appears to be typical of the region. Any exploration or mining operations which may occur in the future will undoubtedly affect local fauna populations. In a regional context however, the impact of such activities is not expected to be significant. The project is not likely to affect the conservation status of significant fauna species identified in this report. In accordance with the Wildlife Conservation Act 1950 however, ministerial approval is required prior to disturbing areas within the Exploration Licence where declared rare fauna, such as the Malleefowl, are known to occur.

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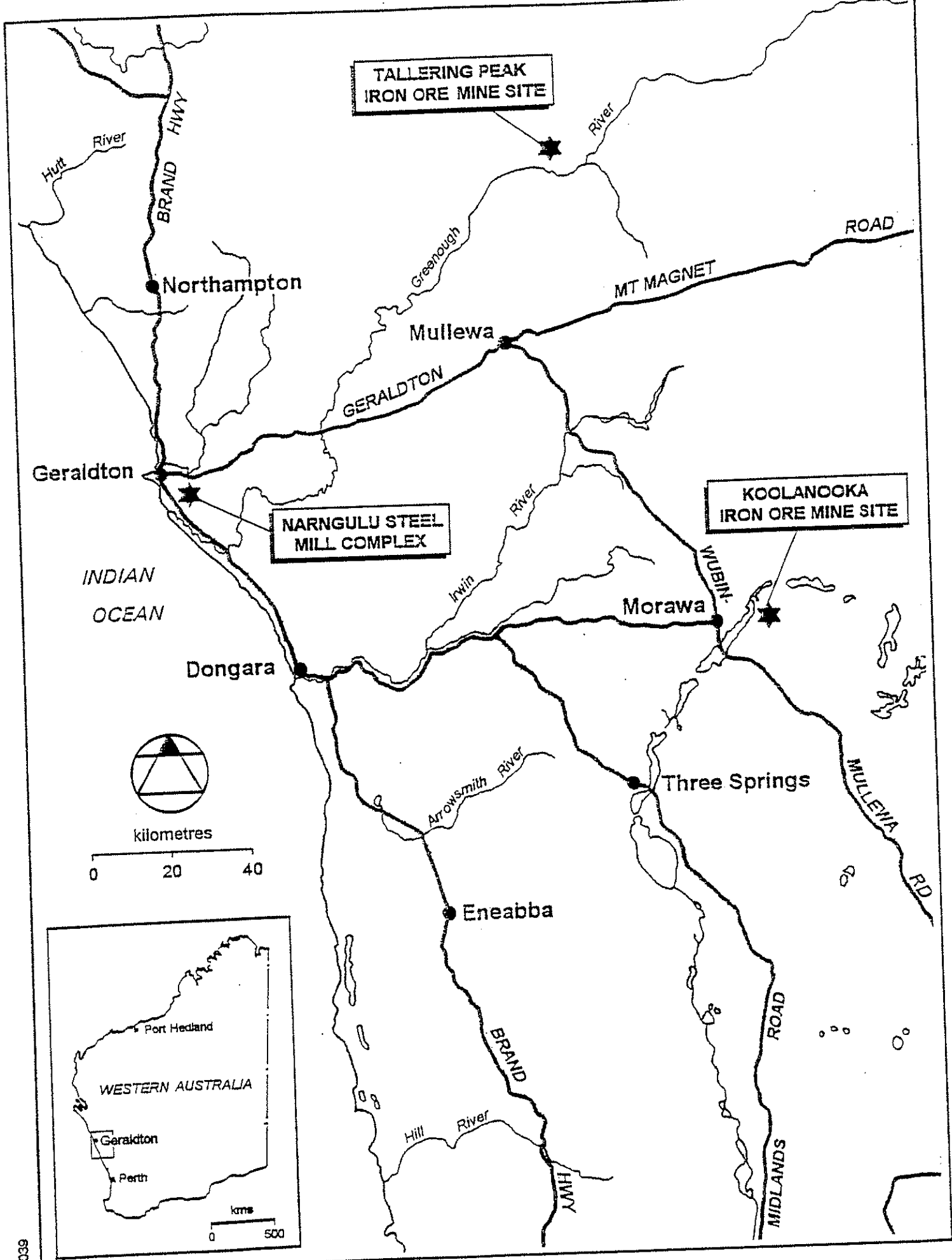
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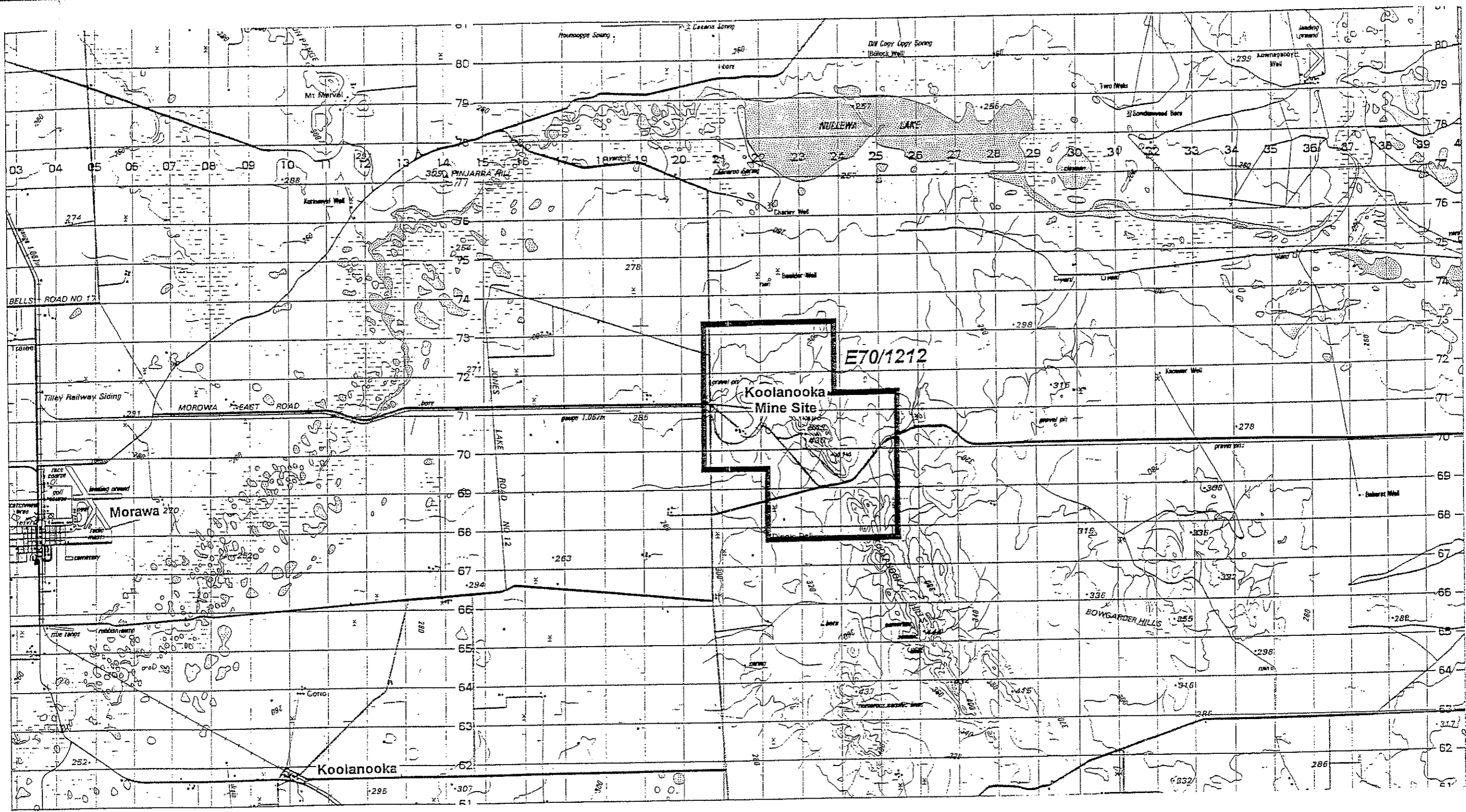
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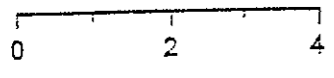
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MID WEST IRON & STEEL PROJECT
 REGIONAL LOCATION OF KOOLANOOKA MINE SITE
 FIGURE 1

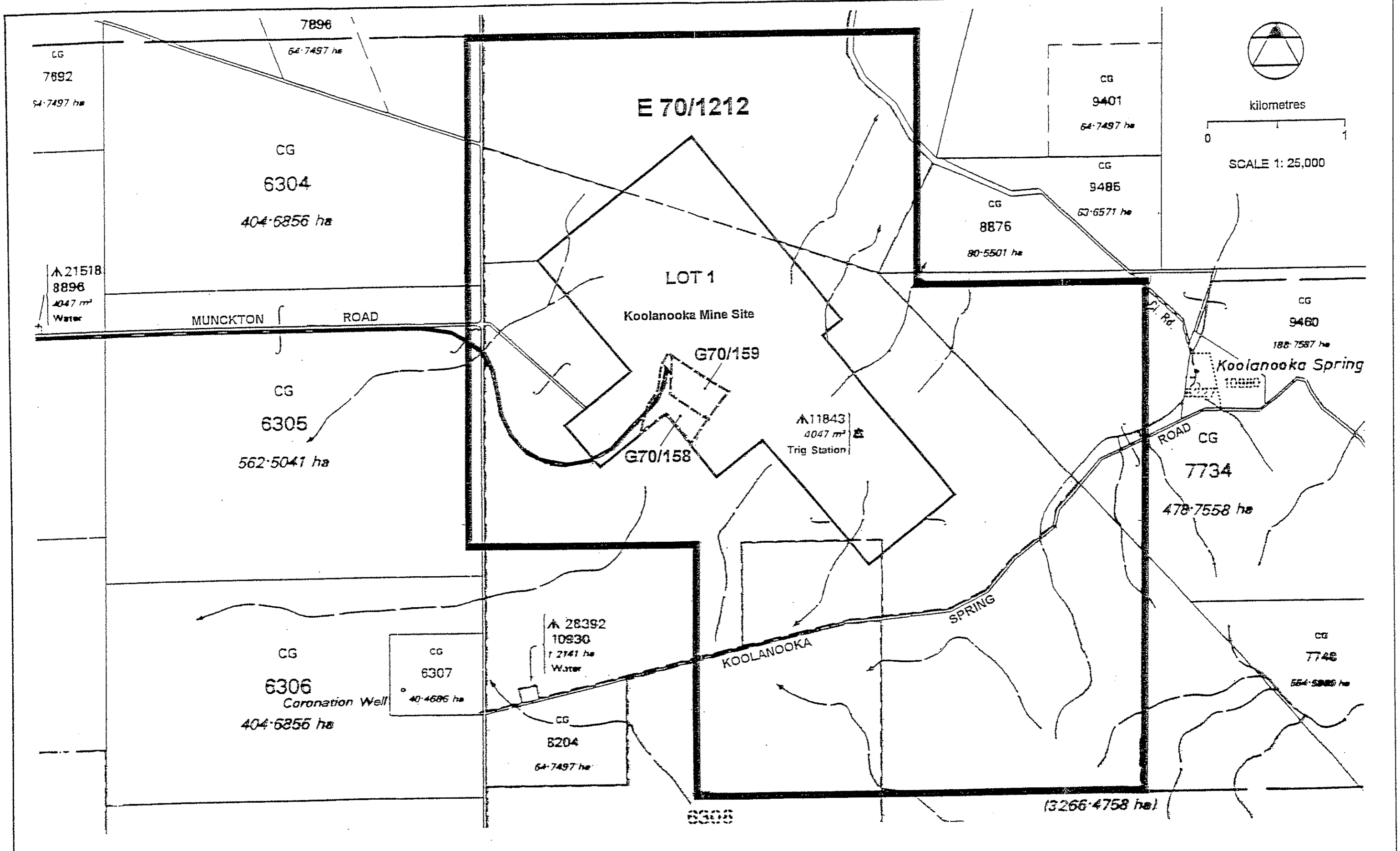


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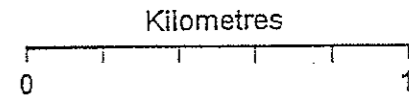
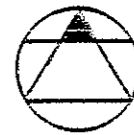
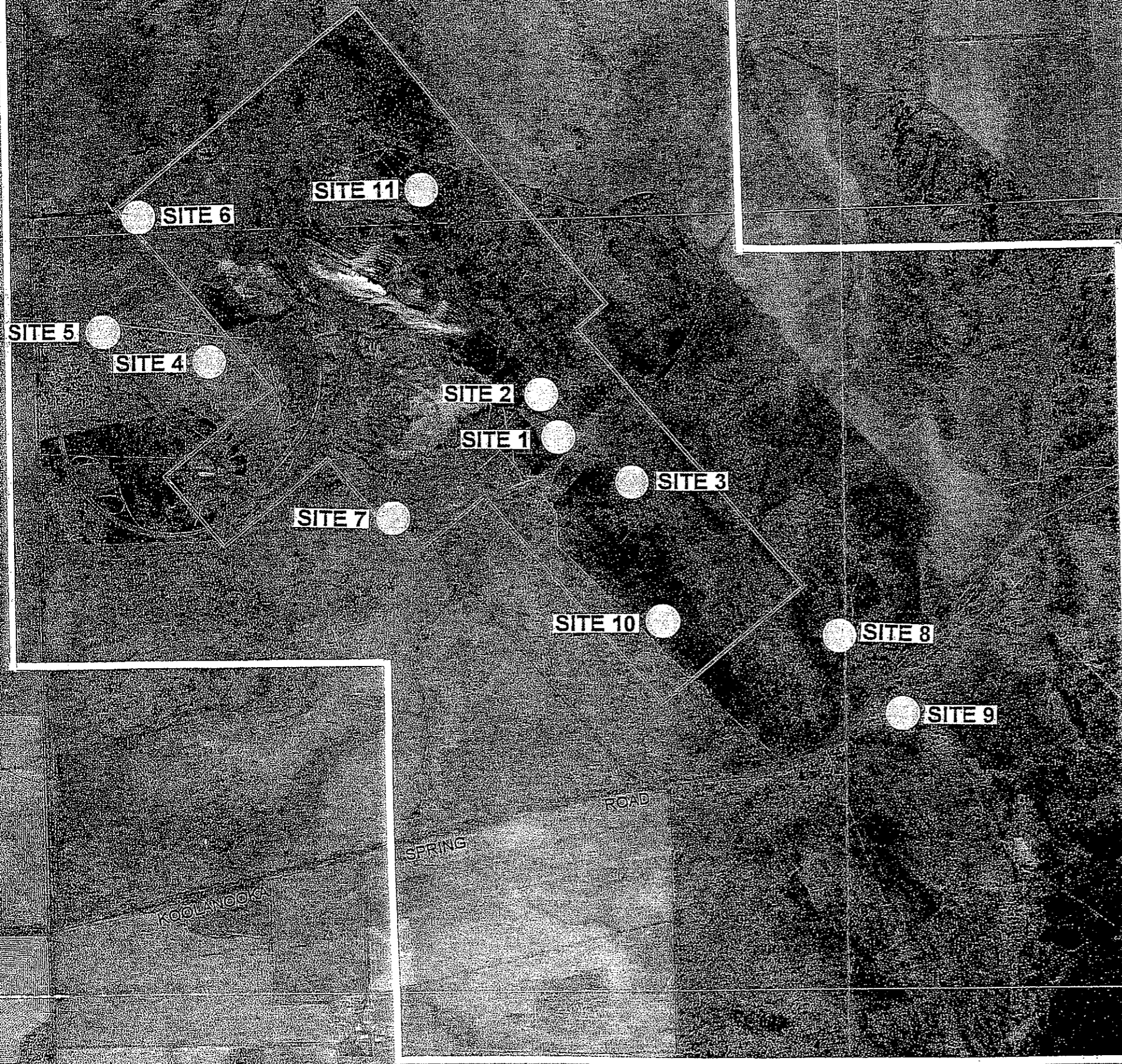
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MID WEST IRON AND STEEL PROJECT
 LOCATION OF EXPLORATION LICENCE AREA E 70/1212
 FIGURE 2



MID WEST IRON AND STEEL PROJECT
 KOOLANOOKA MINE SITE
 FIGURE 3

E 70/1212



SCALE 1:20,000

LEGEND

- Boundary of Exploration Licence
- Boundary of Lot 1
- Fauna Survey Sites

MID WEST IRON & STEEL PROJECT
KOOLANOOKA MINE SITE
LOCATION OF FAUNA SURVEY SITES
FIGURE 4

APPENDIX 1

VERTEBRATE FAUNA RECORDED JUNE 1996

APPENDIX 1
 VERTEBRATE FAUNA RECORDED
 JUNE 1996

KEY:

- S = Species protected under the Wildlife Conservation Act (1950, amended 1996).
- P = Species listed on the Department of Conservation and Land Management's Priority Fauna List.
- * = Species located outside Exploration Licence area in adjacent farming land.

MAMMALS

TACHYGLOSSIDAE <i>Tachyglossus aculeatus</i>	Short-beaked Echidna
MACROPODIDAE * <i>Macropus fulliginosus</i> <i>Macropus robustus</i>	Western Grey Kangaroo Common Wallaroo
MOLOSSIDAE <i>Nyctinomus australls</i>	White-striped Freetail-bat
VESPERTILIONIDAE * <i>Chalinolobus gouldii</i> <i>Vespadelus regulus</i>	Gould's Wattled Bat Southern Forest Bat
MURIDAE <i>Pseudomys hermannsburgensis</i> <i>Mus musculus</i>	Sandy Inland Mouse House mouse
CANIDAE <i>Vulpes vulpes</i>	Fox
FELIDAE <i>Felis catus</i>	Cat
LEPORIDAE <i>Oryctolagus cuniculus</i>	Rabbit
BOVIDAE <i>Capra hircus</i>	Goat

BIRDS

CASUARIIDAE <i>Dromolus novaehollandiae</i>	Emu
MEGAPODIIDAE <i>Lepoa ocellata</i>	S Malleefowl

ANATIDAE

Tadorna tadomoides
Anas superciliosa
Anas gracilis

Mountain Duck
Black Duck
Grey Teal

PODICIPEDIDAE

Pollocephalus pollocephalus

Hoary-headed Grebe

ACCIPITRIDAE

Aquila audax

Wedge-tailed Eagle

FALCONIDAE

Falco berigora
**Falco longipennis*
Falco cenchroides

Brown Falcon
Australian Hobby
Australian Kestrel

TURNICIDAE

Turnix varia

Painted Button-quail

COLUMBIDAE

Phaps chalcoptera
Ocyphaps lophotes

Common Bronzewing
Crested Pigeon

CACATUIDAE

Cacatua roseicapilla

Galah

PSITTACIDAE

Barnardius zonarius
Psephotus varius

Port Lincoln Ringneck
Mulga Parrot

CAPRIMULGIDAE

Eurostopodus argus

P

Spotted Nightjar

AEGOTHELIDAE

Aegotheles cristatus

Australian Owlet-Nightjar

MALURIDAE

Malurus splendens
Malurus pulcherrimus

Splendid Fairy-wren
Blue-breasted Fairy-wren

PARDALOTIDAE

Pardalotus striatus
Pyrrholaemus brunneus
Smicromis brevirostris
Acanthiza apicalis
Acanthiza uropygialis
Acanthiza chrysorrhoa
Aphelocephala leucopsis

Striated Pardalote
Redthroat
Weebill
Inland Thornbill
Chestnut-rumped Thornbill
Yellow-rumped Thornbill
Southern Whiteface

MELIPHAGIDAE

Acanthagenys rufogularis
Manorina flavigula
Lichenostomus virescens
**Lichmera indistincta*

Spiny-cheeked Honeyeater
Yellow-throated Miner
Singing Honeyeater
Brown Honeyeater

PETROICIDAE

Eopsaltria griseogularis
Drymodes brunneopygia

Western Yellow Robin
Southern Scrub-robin

POMATOSOMIDAE

Pomatostomus superciliosus

White-browed Babbler

CINCLOSOMATIDAE

Cinclosoma castanotus

Chestnut Quail-thrush

PACHYCEPHALIDAE

Oreoca gutturalis
Pachycephala pectoralis
Colluricincla harmonica

Crested Bellbird
Golden Whistler
Grey Shrike-thrush

DICRURIDAE

**Grallina cyanoleuca*
Rhipidura fulliginosa
Rhipidura leucophrys

Australian Magpie-lark
Grey Fantail
Willie Wagtail

CAMPEPHAGIDAE

**Coracina novaehollandiae*

Black-faced Cuckoo-shrike

ARTAMIDAE

**Artamus cinereus*
Artamus minor
Cracticus torquatus
**Cracticus nigrogularis*
Gymnorhina tibicen

Black-faced Woodswallow
Little Woodswallow
Grey Butcherbird
Pied Butcherbird
Australian Magpie

CORVIDAE

Corvus coronoides
Corvus bennetti

Australian Raven
Little Crow

MOTACILLIDAE

Anthus novaeseelandiae

Richard's Pipit

PASSERIDAE

Taenopygia guttata

Zebra Finch

HIRUNDINIDAE

Cheramoeca leucosternus
Hirundo neoxena
Hirundo nigricans

White-backed Swallow
Welcome Swallow
Tree Martin

REPTILES

GEKKONIDAE

Gehyra variegata
Heteronotia binoei
Underwoodisaurus millii

Tree Dtella
Bynoe's Gecko
Thick-tailed Gecko

PYGOPODIDAE

Delma australis

Acrochordus ...

SCINCIDAE

Cryptoblepharus plagiocephalus

Ctenotus pantherinus

Egernia depressa

Lerista gerrardii

Morethia butleri

Pygmy Spiny-tailed Skink

ELAPIDAE

Pseudechis australis

Mulga or King Brown Snake

AMPHIBIANS

LEPTODACTYLIDAE

**Pseudophryne occidentalis*

APPENDIX 2

**DISTRIBUTION OF VERTEBRATE FAUNA RECORDED
JUNE 1996**

	SITE												
	1	2	3	4	5	6	7	8	9	10	11	12	13
BIRDS													
CASUARIIDAE													
<i>Dromaius novaehollandiae</i>				T		T						T	T
MEGAPODIDAE													
<i>Leipoa ocellata</i>		T						T					
ANATIDAE													
<i>Tadoma tadomoides</i>												4	
<i>Anas superciliosa</i>												2	
<i>Anas gracilis</i>												31	
PODICIPEDIDAE													
<i>Pollocephalus pollocephalus</i>												4	
ACCIPITRIDAE													
<i>Aquila audax</i>	2	2	2									7	3
FALCONIDAE													
<i>Falco bergora</i>			1										1
* <i>Falco longipennis</i>													1
<i>Falco cenchroides</i>												2	1
TURNICIDAE													
<i>Turnix varla</i>		T											
COLUMBIDAE													
<i>Phaps chalcoptera</i>								2	2	2	2		
<i>Ocyphaps lophotes</i>												3	95
CACATUIDAE													
<i>Cacatua roseicapilla</i>	2								2				25
PSITTACIDAE													
<i>Barnardius zonarius</i>	4	2	5			2	2			2	3		36
<i>Psephotus varius</i>	2								2			18	2
CAPRIMULGIDAE													
<i>Eurostopodus argus</i>	1												1
AEGOTHELIDAE													
<i>Aegotheles cristatus</i>	1												
MALURIDAE													
<i>Malurus splendens</i>		2		5					5				5
<i>Malurus pulcherrimus</i>			4	4									
PARDALOTIDAE													
<i>Pardalotus striatus</i>		10											
<i>Pyrrholaemus brunneus</i>	3		2	6	5	3	3	2			3		
<i>Smicromis brevirostris</i>	3		4		8		4	4	11			2	
<i>Acanthiza apicalis</i>	1	1		2	1		1	3	2		2		

APPENDIX 3

**ADDITIONAL VERTEBRATE SPECIES EXPECTED TO
OCCUR IN HABITATS WITHIN, AND ADJACENT TO,
THE STUDY AREA**

APPENDIX 3

ADDITIONAL VERTEBRATE SPECIES EXPECTED TO OCCUR IN HABITATS WITHIN, AND ADJACENT TO, THE STUDY AREA

(List Derived from References Listed in Methods)

KEY:

- S = Species protected under the Wildlife Conservation Act (1950, amended 1996).
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MAMMALS

DASYURIDAE

Sminthopsis crassicaudata

Sminthopsis dolichura

Sminthopsis granullipes

Fat-tailed Dunnart

Little Long-tailed dunnart

White-tailed Dunnart

MOLOSSIDAE

Mormopterus planiceps

Southern Freetail-bat

VESPERTILIONIDAE

Nyctophilus geoffroyi

Nyctophilus timoriensis

Chalinolobus morio

Scotorepens balstoni

Lesser Long-eared Bat

Greater Long-eared Bat

Chocolate Wattled Bat

Inland Broad-nosed Bat

MURIDAE

Notomys mitchellii

Mitchell's Hopping-mouse

BIRDS

ANATIDAE

Chenonetta jubata

Wood Duck

PODICIPEDIDAE

Tachybaptus novaehollandiae

Australasian Grebe

ARDEIDAE

Egretta novaehollandiae

Ardea pacifica

White-faced Heron

Pacific Heron

ACCIPITRIDAE

Elanus axillaris

Circus assimilis

Accipiter fasciatus

Accipiter cirrhocephalus

Hieracetus morphnoides

Black-shouldered Kite

Spotted Harrier

Brown Goshawk

Collared Sparrowhawk

Little Eagle

FALCONIDAE

Falco peregrinus

S

Peregrine Falcon

BURHINIDAE <i>Burhinus grallarius</i>	P	Bush Stone-curlew
CACATUIDAE <i>Calyptorhynchus banksii</i> <i>Cacatua leadbeateri</i>	S	Red-tailed Black Cockatoo Major Mitchell's Cockatoo
PSITTACIDAE <i>Glossopsitta porphyrocephala</i> <i>Neophema elegans</i>		Purple-crowned Lorikeet Elegant Parrot
CUCULIDAE <i>Cuculus pallidus</i> <i>Cacomantis flabelliformis</i> <i>Chrysococcyx osculans</i> <i>Chrysococcyx basalis</i> <i>Chrysococcyx lucidus</i>		Pallid Cuckoo Fan-tailed Cuckoo Black-eared Cuckoo Horsfield's Bronze-cuckoo Shining Bronze-cuckoo
STRIGIDAE <i>Ninox novaeseelandiae</i>		Boobook
TYTONIDAE <i>Tyto alba</i>		Barn Owl
PODARGIDAE <i>Podargus strigoides</i>		Tawny Frogmouth
HALCYONIDAE <i>Todiramphus pyrropygia</i> <i>Todiramphus sancta</i>		Red-backed Kingfisher Sacred Kingfisher
MEROPIDAE <i>Merops ornatus</i>		Rainbow Bee-eater
CLIMACTERIDAE <i>Climacteris rufa</i>		Rufous Treecreeper
PARDALOTIDAE <i>Pardalotus punctatus</i> <i>Gerygone fusca</i>		Spotted Pardalote Western Gerygone
MELIPHAGIDAE <i>Anthochaera carunculata</i> <i>Uchenostomus leucotis</i> <i>Uchenostomus ornatus</i> <i>Meliphreptus brevirostris</i> <i>Phylidonyris albilfrons</i> <i>Certhionyx niger</i> <i>Certhionyx variegatus</i> <i>Ephthianura albilfrons</i>		Red Wattlebird White-eared Honeyeater Yellow-plumed Honeyeater Brown-headed Honeyeater White-fronted Honeyeater Black Honeyeater Pied Honeyeater White-fronted Chat
PETROICIDAE <i>Microeca leucophaea</i> <i>Petroica goodenovii</i>		Jacky Winter Red-capped Robin
NEOSITTIDAE <i>Daphoenositta chrysoptera</i>		Varied Sittella

PACHYCEPHALIDAE
Pachycephala rufiventris

Rufous Whistler

CAMPEPHAGIDAE
Coracina maxima
Lalage sueurii

Ground Cuckoo-shrike
White-winged Triller

ARTAMIDAE
Artamus personatus
Artamus superciliosus
Artamus cyanopterus
Strepera versicolor

Masked Woodswallow
White-browed Woodswallow
Dusky Woodswallow
Grey Currawong

DICAEIDAE
Dicaeum hirundinaceum

Mistletoebird

SYLVIIDAE
Cincloramphus mathewsi
Cincloramphus cruralis

Rufous Songlark
Brown Songlark

ZOSTEROPIDAE
Zosterops lateralis

Grey-breasted White-eye

REPTILES

GEKKONIDAE
Diplodactylus granariensis
Diplodactylus maini
Diplodactylus pulcher
Diplodactylus spinigerus
Rhynchoedura ornata

Western Spiny-tailed Gecko
Beaked Gecko

PYGOPODIDAE
Delma fraseri
Lialis burtonis
Pygopus nigriceps

Burton's Snake Lizard
Hooded Scaly Foot

AGAMIDAE
Ctenophorus maculatus
Ctenophorus reticulatus
Ctenophorus scutulatus
Moloch horridus
Pogona minor

Spotted Dragon
Western Netted Dragon
Lozenge-marked Dragon
Thorny Devil
Dwarf Bearded Dragon

SCINCIDAE
Cryptoblepharus carnabyi
Ctenotus mimetes
Ctenotus schomburgkii
Ctenotus uber
Egernia inornata
Egernia stokesii
Eremiascincus richardsonii
Lerista distinguenda
Lerista macropisthopus
Lerista muelleri
Menetia greyii

S

Desert Skink
Gidgee Skink
Broad-banded Sand Swimmer

Morethia obscura
Tiliqua occipitalls
Tiliqua rugosa

Western Blue-tongued Lizard
Bobtail

VARANIDAE
Varanus gouldii
Varanus tristis

Bungarra (Gould's Goanna)
Black-tailed Monitor

TYPHLOPIDAE
Ramphotyphlops australis
Ramphotyphlops hamatus
Ramphotyphlops waitii

BOIDAE
Morelia spilota
Morelia stimsoni

S

Carpet Python
Stimson's Python

ELAPIDAE
Acanthophis antarcticus
Demansia psammophis
Denisonia fasciata
Furina ornata
Pseudonaja modesta
Pseudonaja nuchalis
Rhinoplocephalus gouldii
Rhinoplocephalus monachus
Vermicella bertholdii
Vermicella bimaculata
Vermicella fasciolata
Vermicella semifasciata

Southern Death-adder
Yellow-faced Whipsnake
Rosen's Snake
Orange-naped Snake
Ringed Brown Snake
Gwardar
Gould's Snake
Monk Snake
Jan's Banded Snake
Black-naped Snake
Narrow-banded Snake
Southern Shovel-nosed Snake

AMPHIBIANS

LEPTODACTYLIDAE
Heleporus albopunctatus
Neobatrachus kunapalari
Neobatrachus pelobatoides
Neobatrachus sutor
Neobatrachus wilsmorei

Humming Frog
Shoemaker Frog
Goldfields Bull Frog