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MT GIBSON IRON PELLET PROJECT.

FAUNA SURVEY.

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for

Mt Gibson Iron Limited

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1. SUMMARY.

Mt Gibson Iron Limited is developing the Mt Gibson Iron Pellet Project with a mine at Mt Gibson between Wubin and Paynes Find, a pipeline to the coast, and a treatment plant and ship loading facility north of Dongara. As part of the environmental studies for the development, a survey of the vertebrate fauna including trapping was carried out at the Mt Gibson mine site in October 2000. The surveys used pit, cage and Elliott trapping, and opportunistic searching. Bats were not trapped because no rare species are present in the area. The survey covered all the habitats present, and all areas which will be affected by the mine and associated infrastructure, and the surrounds.

The survey produced no frogs due to dry conditions, 24 species of reptiles, 68 species of birds and six native species of mammals, as well as past evidence of one extinct native mammal, and four introduced mammal species. The number of species recorded was limited by the poor condition of the vegetation due to dry conditions over the previous winter and a history of grazing.

In addition all the vertebrate fauna species which might occur on the site were listed from the habitats present, so that all possible rare species could be considered.

The site is on the boundary of the South-West and semi-arid Eremaean. The site was divided into the following habitats:

- York Gum and Salmon Gum woodlands on sandy loams.
- Shrubs on loam.
- Shrublands and thickets on stony hills with gravel or exposed rocks.
- Mallees and shrub thickets on yellow sandplain.
- A salt lake with samphires on clay and gypsum.

Most of the disturbance will be in the stony hills, sandplain, York Gum woodland and salt lake.

There are no unusual habitat features, and the habitats are replicated widely in the region. The stony hills are the least common habitat regionally. The woodland vegetation is in poor condition due to a long history of grazing, but the sandplain is probably less disturbed. The fauna has the species typical of the dry semi-arid areas and some species from the South-West.

The only rare species of state and national significance found in the survey was the Malleefowl, which is resident and may nest on the site. Other species of state significance may be present or make occasional use of the site, but the impact on these will not be significant and no specific management actions are needed.

The most important rare species present is the Malleefowl. This probably breeds locally and it will be necessary to carry out a detailed survey once the areas of disturbance are known to ensure that the mine does not affect any nest mounds.

There are a limited number of rare species present or possibly present, but the presence of the Malleefowl may require referral under the federal Environment Protection and Biodiversity Conservation Act. This species can be managed adequately.

In total the site has relatively low conservation values due to the fauna except for the Malleefowl because the habitats are replicated widely in the region, much of the vegetation is in poor condition and there are few rare species. Despite these low values the environmental management of mining should recognise the value of all native vegetation as habitat and follow normal practices of minimising the area disturbed, preserving all topsoil and vegetation material, controlling weeds, and rehabilitating the site progressively as far as possible. The only specific management action which should be taken at this stage in relation to the fauna is to watch for Malleefowl nesting mounds.

2. INTRODUCTION.

Mt Gibson Iron Limited is developing the Mt Gibson Iron Pellet Project with a mine at Mt Gibson between Wubin and Paynes Find, a pipeline to the coast, and a treatment plant and ship loading facility north of Dongara. As part of the environmental studies for the development a survey of the vertebrate fauna including trapping was carried out at the Mt Gibson mine site in October 2000 (Figure 1, next page).

Specifically the survey was designed to:

- Examine the habitats present and their condition.
- Determine the fauna species present.
- List the species which might be present on the basis of the habitats present and their condition.
- Determine if any rare vertebrate species are present or likely to be present.
- Describe the conservation value of the fauna and how it should be managed.

The results of the surveys are given here.

3. METHODS.

The fauna habitats present were examined from the soil, topography, vegetation structure and condition, species present and other factors such as the presence of loose rocks, logs and other habitat features. Considerable information was available from a botanical survey of the site.

The vertebrate fauna was examined by a trapping survey using pit, cage and Elliott traps as well as opportunistic searching including observation, listening for calls, searching for bones, feathers, droppings or other signs which could be identified, raking leaf litter, turning over logs, breaking open stumps, head-torching, and driving on tracks. Bats were not trapped because no rare species are present in the area, but bats present in an old mine shaft were examined.

The survey work which used trapping was concentrated in the areas to be actually disturbed, but all habitats were covered and the survey was extended to cover the surrounding area. The trapping used 9 sites. All but one had eight pits in four pairs joined by a drift fence, one cage trap and two Elliott traps. One very rocky site where it was not possible to dig pits had four cage traps and 39 Elliott traps. Trapping was carried out for six or seven nights at each site. Other sites were examined only by hand collecting and observations.

All areas were assessed for habitats and surveyed using opportunistic methods.

All vertebrate fauna species which could be expected to occur on the site were listed from the habitats, general knowledge of the distribution and habitat preferences of the species, and local information. These lists were drawn up to be conservative and to identify all species of interest which might be present.

4. RESULTS.

For the fieldwork the site was divided into the following habitats:

1. York Gum and Salmon Gum woodlands on sandy loams. York Gum is much more widespread and Salmon Gums are restricted to a small area in the south and east, and around the large salt lake. Other trees of eucalypts and *Callitris columellaris* pines may be present in some sites. These trees are over various shrubs, mainly Acacias, but there is considerable bare ground and limited ground cover except litter under the shrubs. In the best areas which have remained unburnt for a long time there are many logs.
2. Shrubs on loam. These are probably heterogeneous and include small patches of open shrubs in low-lying areas of loam over hardpan where there are no trees and denser patches of shrubs on more clayey soils. Acacias are the dominant species but others may be present. Trees are scarce or absent. There is considerable bare ground and very little ground cover except litter, but the densest sites form thickets.
3. Shrublands and thickets on stony hills with gravel or exposed rocks. These vary from shrublands on the stony hills with some bare areas where there is exposed rock to thickets on the more gravelly lower slopes. In a few places there are exposures of massive rock sufficient to have small caves, but there are none of these in the area to be mined. The shrubs on the stony hills are dominated by Acacias but other species are present including myrtles and proteaceous species. On the gravelly slopes sheoak shrubs are often completely dominant but a few other species may be present. Trees are scarce or absent, particularly on the shallower soils. There is considerable bare ground and very little ground cover except litter. In the densest sites the thickets give a very high leaf litter cover.
4. Mallees and thickets on yellow sandplain. The mallees may be absent. The shrubs can be dense and 2-3m tall but are low in species diversity. Acacias are dominant but there may be some sheoaks, myrtles and proteaceous species. Low shrubs are also limited and are mainly of the Rutaceae. There is almost no ground cover except a high litter cover.
5. A salt lake with samphires on clay and gypsum. The vegetation is largely restricted to samphires, with a few grasses and herbs on low gypsum rises. There is a surrounding vegetation of shrublands on stony, sandy or loamy slopes, with a few Salmon Gums. These lakes have surface water for limited times.

These habitats are illustrated in Plates 1-8 (next four pages).



PLATE 1. York Gum woodland.



PLATE 2. Open shrubs, in this case on a stony slope.



PLATE 3. A thicket on loam.



PLATE 4. A thicket on a gravelly slope.



PLATE 5. Shrubland on a stony hill.



PLATE 6. Shrubland similar to Plate 5 but with rock exposure.



PLATE 7. Sandplain vegetation, with mallees.



PLATE 8. Salt lake with samphires and low gypsum rises.

These habitat units are relatively distinct and are usually readily separated in the field. The only minor variation seen was open shrubs on a slight sandy edge around part of the salt lake. This is similar to other units.

The site has been grazed by sheep for a long time, and there has been some mining to the south. The woodland vegetation is generally in poor condition as a result of the grazing, but the shrublands and sandplain have probably been less affected. Grazing by sheep and rabbits is continuing, and goats are common. At the time of the field work in October 2000 the vegetation had almost no winter ephemeral daisies as there had been virtually no winter rain, but there was considerable flowering in the shrubs and trees. The Plates give a good idea of the condition of the vegetation. There was extensive summer rain in early 2000 but this ended in March.

The areas proposed to be disturbed are mainly shrublands on the stony hill and gravel slopes, sandplain, York Gum woodland and the large salt lake. The survey effort was roughly in proportion to these areas of impact.

The locations of the trapping and other sites are given in Figure 2 (next page), and the trapping sites are described in Appendix 1. The trapping carried out at the sites and summary descriptions of the sites are given in Table 1 (page 13).

The species and numbers of animals recorded in the trap sites or in similar habitat nearby are listed in Table 2 (page 14). Two other sites where observations but not trapping were carried out were recorded separately (Map 1). These were:

- Site 10 which is in Salmon Gum woodland around an abandoned mine in the south of the study area, which is most similar to trapping sites 1 and 3.
- Site 11 which was the most rocky area in the south end of the hills with some areas rocky enough to have small caves, most similar to trapping sites 6 and 7.

All the animals recorded at trapping site 2 were caught in the shrubland (see Table 1). No animals were caught in the samphire flat or gypsum rises.

In addition the following species were recorded:

- Tracks of the Bungarra (Goanna) *Varanus gouldii* were common and seen in many areas, and one roadkill was found just to the west on the Highway.
- Two individuals of the Thorny Devil *Moloch horridus* were seen in sandplain to the east.



TABLE 1 Traps used at the trapping sites, and summary description.

Site	Pit nights	Cage nights	Elliott nights	Habitat
1	48	6	12	Typical York Gum woodland
2A	24	-	-	Samphire flat on a salt lake with low gypsum rises
2B	24	6	12	Open shrubs on a stony slope around a salt lake
3	56	7	14	York Gum woodland with the largest trees
4	48	6	12	Thicket on loam
5	48	6	12	Thicket on a gravelly slope
6	56	7	14	Shrubland on a stony hill
7	-	24	234	Shrubland on a rocky hill
8	56	7	14	Dense shrubs on yellow sandplain
9	56	7	14	Mallees over dense shrubs on yellow sandplain
10	-	-	-	Salmon Gum woodland
11	-	-	-	Shrubland on a rocky hill with a few large rock exposures big enough to have small caves

TABLE 2. Individuals recorded in the trap or other sites or in similar habitat nearby. Introduced species are identified by an asterisk (*). Where individuals could not be counted they are recorded as present (X).

SITES	1	2	3	4	5	6	7	8	9	10	11
SPECIES											
A. REPTILES											
GECKOS											
<i>Diplodactylus granariensis</i>	1					1		2			
<i>Diplodactylus maini</i>			2								
<i>Gehyra variegata</i>	2		2			1	4	6		5	
<i>Heteronotia binoei</i>			5		1	1	1	3		9	9
<i>Oedura reticulata</i>			3								
<i>Rhynchoedura ornata</i>										1	
<i>Underwoodisaurus milii</i>							1				1
DRAGON LIZARDS											
<i>Ctenophorus cristatus</i>										1	
<i>Ctenophorus reticulatus</i>		1									
<i>Ctenophorus scutulatus</i>		1	7	2	3	4		1	1		1
<i>Pogona minor</i>	2	3	3	1	1						
SKINKS											
<i>Cryptoblepharus plagiocephalus</i>	8		4								
<i>Ctenotus mimetes</i>		1	1								
<i>Ctenotus schomburgkii</i>	1			2							
<i>Egernia inornata</i>									3		
<i>Eremiascincus richardsonii</i>								1			
<i>Lerista gerrardii</i>	1		1					1		1	
<i>Lerista muelleri</i>	1		6		1	1		5	1		
<i>Menetia greyii</i>	1				4	3			4	1	
<i>Morethia butleri</i>	1									1	
B. MAMMALS											
Short-beaked Echidna		X						X	X		X
Little Long-tailed Dunnart							1				
* House Mouse				1	3	6	9		1		

- An individual of the snake *Pseudonaja nuchalis* (Gwardar) was found in York Gum woodland on a road to the east.
- An individual of the snake *Pseudonaja modesta* was recorded in open shrubland on loam in the south-east of the site, and a moulted skin probably of this species was found in woodland near trapping site 2.
- A very old and disused nesting mound of the Malleefowl was found in the north-eastern part of the site.
- The Common Wallaroo (Euro, *Macropus robustus*) was the most common kangaroo, and although they were widespread they were not common.
- The Grey Kangaroo *Macropus fuliginosus* was seen several times on the eastern side of the site.
- The Red Kangaroo *Macropus rufus* was seen once in the eastern side of the site.
- A breeding colony of the bat *Chalinolobus morio* was found in an old mine shaft in the south end of the stony hills, in an area which will not be affected by the proposed mining.
- A very old burrow of the Burrowing Bettong (*Bettongia lesueur*), which is extinct regionally but identifiable from old burrow mounds, was recorded in the south-east of the site. These are now usually occupied by goannas and rabbits.
- Tracks presumed to be of Foxes were common and widespread.
- Rabbits were widespread but not common.
- The Feral Goat was recorded as common on the east side, although they may also be regarded as stock.
- The Dingo is reported by residents to be still present in the area but rare.

Voucher specimens from some species were collected and placed in the W.A. Museum.

The bird species recorded are given as an annotated list in Table 3 (next three pages).

Two other bird species were seen, a quail and an eagle, but they could not be identified to species.

TABLE 3. Bird species recorded, with notes on their distribution and abundance.

SPECIES		
Emu	<i>Dromaius novaehollandiae</i>	Common and widespread in all habitats
Malleefowl	<i>Leipoa ocellata</i>	Seen in two areas in the north-west and southern parts of the site
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>	Scarce, in woodland
Brown Goshawk	<i>Accipiter fasciatus</i>	Rare, in woodland
Wedge-tailed Eagle	<i>Aquila audax</i>	Seen only once, over the hills
Brown Falcon	<i>Falco berigora</i>	Common
Nankeen Kestrel	<i>Falco cenchroides</i>	Scarce
Common Bronzewing	<i>Phaps chalcoptera</i>	Common and widespread
Crested Pigeon	<i>Ocyphaps lophotes</i>	Seen only once in the south but probably widespread
Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii</i>	Common in woodlands
Galah	<i>Cacatua roseicapilla</i>	Common in woodlands
Little Corella	<i>Cacatua sanguinea</i>	Occasional in woodlands
Pink Cockatoo	<i>Cacatua leadbeateri</i>	Recorded only to the east around water points
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>	Scarce in small flocks in flowering woodlands
Regent Parrot	<i>Polytelis anthopeplus</i>	Common, mainly in woodlands
Australian Ringneck	<i>Barnardius zonarius</i>	Common, and scattered throughout
Black-eared Cuckoo	<i>Chrysococcyx osculans</i>	Widespread, occasional, usually calling from trees
Southern Boobook	<i>Ninox novaeseelandiae</i>	A single bird heard at night in woodland
Sacred Kingfisher	<i>Todiramphus sanctus</i>	Occasional in woodland
Rainbowbird	<i>Merops ornatus</i>	Common in woodland
Rufous Treecreeper	<i>Climacteris rufa</i>	Common in woodland
Splendid Fairy-wren	<i>Malurus splendens</i>	Common, mainly in shrublands
White-winged Fairy-wren	<i>Malurus leucopterus</i>	Seen only in the samphire flats
Striated Pardalote	<i>Pardalotus striatus</i>	Common anywhere there were trees

(Table 3 continued)

Redthroat	<i>Pyrrholaemus brunneus</i>	Scarce, in thickets and shrublands
Shy Heathwren	<i>Hylacola cauta</i>	Recorded only in a thicket on sandplain
Weebill	<i>Smicrornis brevirostris</i>	Very common, but only in trees
Western Gerygone	<i>Gerygone fusca</i>	Scarce, only in woodland
Inland Thornbill	<i>Acanthiza apicalis</i>	Occasional in woodland, shrubs and thickets
Chestnut-rumped Thornbill	<i>Acanthiza uropygialis</i>	Common, in shrublands and woodlands
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	Widespread
Southern Whiteface	<i>Aphelocephala leucopsis</i>	Seen only once, in a woodland
Red Wattlebird	<i>Anthochaera carunculata</i>	Scarce and recorded only in Salmon Gum woodland but probably widespread
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	Common and widespread
Yellow-throated Miner	<i>Manorina flavigula</i>	Scarce, in woodlands
Singing Honeyeater	<i>Lichenostomus virescens</i>	Common in all habitats
White-eared Honeyeater	<i>Lichenostomus leucotis</i>	Recorded only in one area of woodland
Yellow-plumed Honeyeater	<i>Lichenostomus ornatus</i>	Recorded only in one area of woodland
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	Recorded only in one area of woodland
Brown Honeyeater	<i>Lichmera indistincta</i>	Scarce but widespread
White-fronted Honeyeater	<i>Phylidonyris albifrons</i>	Recorded only in one area of woodland
Red-capped Robin	<i>Petroica goodenovii</i>	Common in shrublands and woodlands
Western Yellow Robin	<i>Eopsaltria griseogularis</i>	Scarce, only in shrublands
Southern Scrub-Robin	<i>Drymodes brunneopygia</i>	Common in thickets, rare in woodlands
White-browed Babbler	<i>Pomatostomus superciliosus</i>	Sparse but widespread
Chestnut Quail-thrush	<i>Cinclosoma castanotus</i>	Rare, recorded only in open shrublands
Crested Bellbird	<i>Oreoica gutturalis</i>	Common and widespread

(Table 3 continued)

Golden Whistler	<i>Pachycephala pectoralis</i>	Seen only once in a thicket
Rufous Whistler	<i>Pachycephala rufiventris</i>	Common and widespread in shrublands and woodlands
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	Common and widespread in shrublands and woodlands
Grey Fantail	<i>Rhipidura fuliginosa</i>	Recorded only in River gums
Willie Wagtail	<i>Rhipidura leucophrys</i>	Occasional in shrublands and woodlands
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	Occasional, mainly in woodlands
White-winged Triller	<i>Lalage sueurii</i>	Scarce, recorded only in one patch of woodland
Black-faced Woodswallow	<i>Artamus cinereus</i>	Scarce, in woodlands
Little Woodswallow	<i>Artamus minor</i>	Rare, only seen around the hills
Grey Butcherbird	<i>Cracticus torquatus</i>	Common and widespread
Pied Butcherbird	<i>Cracticus nigrogularis</i>	Common and widespread
Australian Magpie	<i>Gymnorhina tibicen</i>	Scarce, only seen in woodland
Grey Currawong	<i>Strepera versicolor</i>	Scarce but widespread in woodland and shrublands
Australian Raven	<i>Corvus coronoides</i>	Common and widespread
Little Crow	<i>Corvus bennetti</i>	Common and widespread
Torresian Crow	<i>Corvus orru</i>	Uncertain due to difficulty in distinguishing from the Little Crow
Richard's Pipit	<i>Anthus novaeseelandiae</i>	Recorded only around the salt lake
Mistletoebird	<i>Dicaeum hirundinaceum</i>	Recorded only once in woodland
White-backed Swallow	<i>Cheramoeca leucosternum</i>	Recorded only once over a thicket with excavations suitable for nesting
Welcome Swallow	<i>Hirundo neoxena</i>	Scarce, only in woodland near water
Tree Martin	<i>Hirundo nigricans</i>	Common and widespread, in woodlands

In total the survey recorded no species of frogs, 24 species of reptiles, 68 species of birds and six native species of mammals, as well as past evidence of one extinct native mammal, and various introduced or stock mammal species.

A complete list of vertebrate species recorded in and around the site is given in Table 4 (next four pages).

Appendix 2 lists all vertebrate species known to occur or which might occur on the site. The species are listed by habitat although in many cases they may well cross into other habitats at times. The habitats have been reduced to 4 with the shrublands on loam combined with the woodlands as there is little difference for most species. Appendix 2 was drawn up conservatively so that all species of possible interest could be identified.

TABLE 4. List of all vertebrate species recorded. Introduced species are identified by an asterisk (*), and extinct species recorded by some evidence are identified by two asterisks (**).

SPECIES	
A. REPTILES	
GEKKONIDAE	Geckos
<i>Diplodactylus granariensis</i>	
<i>Diplodactylus maini</i>	
<i>Gehyra variegata</i>	
<i>Heteronotia binoei</i>	
<i>Oedura reticulata</i>	
<i>Rhynchoedura ornata</i>	
<i>Underwoodisaurus milii</i>	
AGAMIDAE	Dragon Lizards
<i>Ctenophorus cristatus</i>	
<i>Ctenophorus reticulatus</i>	
<i>Ctenophorus scutulatus</i>	
<i>Moloch horridus</i>	Thorny Devil
<i>Pogona minor</i>	Bearded Dragon
SCINCIDAE	Skinks
<i>Cryptoblepharus plagioccephalus</i>	
<i>Ctenotus mimetes</i>	
<i>Ctenotus schomburgkii</i>	
<i>Egernia inornata</i>	
<i>Eremiascincus richardsonii</i>	
<i>Lerista gerrardii</i>	
<i>Lerista muelleri</i>	
<i>Menetia greyii</i>	
<i>Morethia butleri</i>	
VARANIDAE	Monitors
<i>Varanus gouldii</i>	Bungarra
ELAPIDAE	Elapid Snakes
<i>Pseudonaja modesta</i>	
<i>Pseudonaja nuchalis</i>	Gwardar

(Table 4 continued)

B. BIRDS	
Emu	<i>Dromaius novaehollandiae</i>
Malleefowl	<i>Leipoa ocellata</i>
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>
Brown Goshawk	<i>Accipiter fasciatus</i>
Wedge-tailed Eagle	<i>Aquila audax</i>
Brown Falcon	<i>Falco berigora</i>
Nankeen Kestrel	<i>Falco cenchroides</i>
Common Bronzewing	<i>Phaps chalcoptera</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii</i>
Galah	<i>Cacatua roseicapilla</i>
Little Corella	<i>Cacatua sanguinea</i>
Pink Corella	<i>Cacatua leadbeateri</i>
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>
Regent Parrot	<i>Polytelis anthopeplus</i>
Australian Ringneck	<i>Barnardius zonarius</i>
Black-eared Cuckoo	<i>Chrysococcyx osculans</i>
Southern Boobook	<i>Ninox novaeseelandiae</i>
Sacred Kingfisher	<i>Todiramphus sanctus</i>
Rainbowbird	<i>Merops ornatus</i>
Rufous Treecreeper	<i>Climacteris rufa</i>
Splendid Fairy-wren	<i>Malurus splendens</i>
White-winged Fairy-wren	<i>Malurus leucopterus</i>
Striated Pardalote	<i>Pardalotus striatus</i>
Redthroat	<i>Pyrholaemus brunneus</i>
Shy Heathwren	<i>Hylacola cauta</i>
Weebill	<i>Smicronis brevirostris</i>
Western Gerygone	<i>Gerygone fusca</i>
Inland Thornbill	<i>Acanthiza apicalis</i>
Chestnut-rumped Thornbill	<i>Acanthiza uropygialis</i>
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
Southern Whiteface	<i>Aphelocephala leucopsis</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>
Yellow-throated Miner	<i>Manorina flavigula</i>
Singing Honeyeater	<i>Lichenostomus virescens</i>
White-eared Honeyeater	<i>Lichenostomus leucotis</i>
Yellow-plumed Honeyeater	<i>Lichenostomus ornatus</i>

(Table 4 continued)

Brown-headed Honeyeater	Melithreptus brevirostris
Brown Honeyeater	Lichmera indistincta
White-fronted Honeyeater	Phylidonyris albifrons
Red-capped Robin	Petroica goodenovii
Western Yellow Robin	Eopsaltria griseogularis
Southern Scrub-Robin	Drymodes brunneopygia
White-browed Babbler	Pomatostomus superciliosus
Chestnut Quail-thrush	Cinclosoma castanotus
Crested Bellbird	Oreoica gutturalis
Golden Whistler	Pachycephala pectoralis
Rufous Whistler	Pachycephala rufiventris
Grey Shrike-thrush	Colluricincla harmonica
Grey Fantail	Rhipidura fuliginosa
Willie Wagtail	Rhipidura leucophrys
Black-faced Cuckoo-shrike	Coracina novaehollandiae
White-winged Triller	Lalage sueurii
Black-faced Woodswallow	Artamus cinereus
Little Woodswallow	Artamus minor
Grey Butcherbird	Cracticus torquatus
Pied Butcherbird	Cracticus nigrogularis
Australian Magpie	Gymnorhina tibicen
Grey Currawong	Strepera versicolor
Australian Raven	Corvus coronoides
Little Crow	Corvus bennetti
Torresian Crow	Corvus orru
Richard's Pipit	Anthus novaeseelandiae
Mistletoebird	Dicaeum hirundinaceum
White-backed Swallow	Cheramoeca leucosternum
Welcome Swallow	Hirundo neoxena
Tree Martin	Hirundo nigricans
C. MAMMALS	
TACHYGLOSSIDAE	
Tachyglossus aculeatus	Short-beaked Echidna
DASYURIDAE	
Sminthopsis dolichura	Little Long-tailed Dunnart
POTOROIDAE	
** Bettongia lesueur	Burrowing Bettong

(Table 4 continued)

MACROPODIDAE	
Macropus fuliginosus	Grey Kangaroo
Macropus robustus	Common Wallaroo
Macropus rufus	Red Kangaroo
VESPERTILIONIDAE	
Chalinolobus morio	Chocolate Wattled Bat
MURIDAE	
* Mus musculus	House Mouse
CANIDAE	
* Vulpes vulpes	Fox
LEPORIDAE	
* Oryctolagus cuniculus	Rabbit
BOVIDAE	
* Capra hircus	Feral Goat

5. DISCUSSION.

The survey was designed to cover all habitats present and all sites which may be impacted (Table 1). In total the survey recorded:

- no species of frogs
- 24 species of reptiles
- 68 species of birds
- 6 native species of mammals, as well as past evidence of one extinct native mammal, and
- 4 introduced mammal species.

This is a reasonable total given that the survey was carried out at the end of a dry winter, but would not be the complete list of species actually present. Some common birds, for example the Magpie-lark, Pallid Cuckoo and Horsfield's Bronze-Cuckoo, were not seen but would be expected to be seen with further searching at a different time. Appendix 2 lists many other species which might be present.

The species found (Table 4) are typical of the habitats present and the region. The fauna is primarily that of the semi-arid south of W.A. but also includes a significant element of the fauna of the South-West such as the birds the Western Yellow Robin, Southern Scrub-Robin and Golden Whistler.

Introduced fauna species are restricted to a suite of mammals which are found over large areas of Western Australia. The most important species would be the House Mouse, Cat, Fox, Rabbit and Goat. These species are probably having a significant impact on the fauna both directly and by their impact on the vegetation, but no control of these feral species is possible on a local scale.

It is not known how many of the species in Appendix 2 actually occur on the site, but the list was drawn up conservatively to detect all species of interest. Some of the frogs and many of the reptiles would be found at some time. The field work (Table 2) suggested that the reptiles were present at low densities. This was probably due to a combination of the poor quality of the habitat which has been grazed and the dry conditions over the previous winter. The woodlands, shrublands, and salt lake will have been affected by grazing, but the thickets and sandplain have probably not been affected to the same extent although they may have been burnt and grazed at times. A good number of bird species was recorded (Table 3). Most of the bird species listed in Appendix 2 would be found at some time because they are so mobile.

The mammal fauna of the site appears to be impoverished. The only native small mammal species found was the marsupial carnivore *Sminthopsis dolichura*, and only a single individual was trapped. Only the Echidna, kangaroos, bats and introduced species are seen regularly. Small and medium-sized mammals in particular are scarce in the arid country, particularly where there has been grazing. The majority of the medium-sized mammals are now extinct, and the poverty of the small mammal fauna in grazed areas with a sparse vegetation is well known. Hall, McKenzie and Keighery (1994) and Dell, How, Milewski and Keighery (1988) have reviewed the regional fauna to the east in the goldfields.

There are several small mammal species which may occur in the sandplain but it is not known if these are present locally. Burbidge, Dixon and Fuller (1989) recorded a good mammal fauna nearby at White Well, and further searching could find these species.

The fauna conservation values which could be given to the site derive from:

- The presence of rare species.
- The rarity and conservation status of the landforms, vegetation units and the fauna habitats provided by these.
- The value of the site in a local and regional context because of its position and regardless of its intrinsic value.

Most of the species listed in Appendix 2 are common or widespread, but some are rare or of conservation interest. The only such species actually found in the survey described here were the Malleefowl and Pink Cockatoo, but others are expected to be present or might be present (Appendix 2).

The only living species listed in Appendix 2 which is of national significance and gazetted under Schedule 1 of the Wildlife Act as "Rare or likely to become extinct" is:

- The Malleefowl (*Leipoa ocellata*). This species was seen regularly around the north-western corner of the site and to the south around site 10. It presumably breeds locally. This species is now very rare over much of its former range. It is still widespread, and most common along the boundary region of the semi-arid and South-West in reasonably dense vegetation. It has declined or become extinct in the South-West proper and Goldfields. It is assumed to have declined due to habitat degradation and fox predation, but still persists in areas where foxes are common.

This species is listed as "Vulnerable" under the federal Environmental Protection and Biodiversity Conservation (EPBC) Act.

Evidence of an old burrow of the Burrowing Bettong (*Bettongia lesueur*) was found in at least one site. This species is extinct on the mainland, and is now very rare and restricted to islands and the few mainland sites where it has been recently re-introduced under controlled conditions. The old burrows remain visible for many years, but are now commonly occupied by goannas and rabbits. It is gazetted as a Schedule 1 species but has not been present regionally as a living species for many years.

There are four species listed in Appendix 2 which are gazetted under Schedule 4 of the Wildlife Act as "In need of special protection", but not listed nationally. These are:

- The Woma (*Aspidites ramsayi*), a python. This was once widespread across southern Western Australia but is now very rare and rarely recorded, and is probably extinct over large parts of its former range. It may even be completely extinct in the south. There are other populations and it is still common in the north of Western Australia. There is a small chance that this species is actually present on the site considered here, and it would be most likely to occur in the sandy areas. It would not be dependent on small areas of habitat for its survival.
- Carpet Python (*Morelia spilota*). This is widespread in the south-west of W.A. but rare or threatened in some areas such as the wheatbelt, and is partly gazetted to protect it from illegal capture and unnecessary killing. It is an attractive python which is usually found under logs or rocks and may even be found around human settlements (Wilson and Knowles 1988). This species may persist in this area, but at a low density. It is often killed around human settlements because it is mistaken for a large venomous snake. It is widespread but scarce regionally, and declining in more cleared areas.
- The Peregrine Falcon (*Falco peregrinus*), which is a widespread although uncommon species. This species was previously regarded as threatened by egg-shell thinning due to pesticides, illegal hunting as a pest, and capture for falconry and the cage trade (Kennedy 1990), but has now been deleted from the national Action Plan for Australian birds (Garnett and Crowley 2000). In Western Australia it is mainly gazetted to protect it from illegal capture. It would make use of the site considered here when hunting other birds but would probably not breed as it favours cliffs and larger trees (Johnstone and Storr 1998). This species would not be affected by the loss of small areas of habitat.
- Pink (Major Mitchell's) Cockatoo (*Cacatua leadbeateri*) which was seen to the east around water points and tall trees, but would occur on the site at times. It inhabits woodlands and shrublands, preferably where there is water and tall trees for nesting. It is partly threatened in more settled areas by loss of nesting trees. It would make use of the site considered here for feeding, and could breed locally. It should be regarded as a scarce but resident species (Storr 1991). It would not be affected significantly by the loss of a small area of habitat.

In addition to these species which have a formal gazetted conservation status, the Department of Conservation and Land Management also maintains a Priority list of species which are restricted, vulnerable or too poorly known to be considered for gazetting. These species have no special protection, but their presence is normally considered.

The Priority list species which might occur on the site are all Priority 4 species:

- The Square-tailed Kite (*Lophoictinia isura*) which occurs mainly in southern Western Australia and sparsely up to the Pilbara and in central Australia. It prefers woodland areas, and would make use of the site considered here at times. In regional reviews Storr (1985, 1991) did not list it as present, but Blakers *et al.* (1984) recorded it as rare throughout the region. This species is scarce but widespread this far inland and it would not be threatened by the loss of such a small area of habitat.
- The Grey Falcon (*Falco hypoleucos*) which occurs mainly in central Australia but may be seen occasionally from the Pilbara and Goldfields across into south-eastern Australia. It occurs in a variety of mainly open habitats including Acacia shrublands and open woodlands. It is rare this far south, although it has been reported in the south-west as a vagrant. It would be present on the site considered here as a rare visitor and not as a resident species. In regional reviews Storr (1985, 1991) regarded it as about at its southern limit in the Gascoyne area, but Blakers *et al.* (1984) recorded it further south. It would not be affected significantly by the loss of such a small area of incidental habitat.
- The Bush Stone-Curlew (*Burhinus grallarius*) which is widespread over much of Australia although it has declined greatly in the south possibly due to fox predation and changes in the vegetation due to grazing. It is still present although uncommon in the South-West and Goldfields, despite the presence of the fox. It prefers woodland with grass but can be found in a variety of habitats. It is probably present in the area as a regular but rare visitor, and as a species it would not be threatened by the loss of such small areas of grazed habitat.
- The Scarlet-chested Parrot (*Neophema splendida*) which is a rare species of mainly central Australia where it inhabits open woodlands and scrubs often over spinifex, and appears to show great variation in abundance over the years. Its normal range is to the east of the site considered here, but it is a casual visitor further west although it has declined (Storr 1985, 1991). In some years it can become common and may occur much further west and even in the South-West. This species would be an occasional visitor but it would not be affected significantly by the loss of such a small area of incidental habitat.

Priority 4 species are defined as "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 be if present circumstances change. These taxa are usually represented on conservation lands".

Species protected under international treaties are also listed under the federal Environment Protection and Biodiversity Conservation (EPBC) Act as triggers for application of the Act. The species in Appendix 2 which are protected in this way are:

- Rainbow Bee-eater and Fork-tailed Swift. Both are migrants, but both are common and widespread in Australia and require no specific management. There would be no impact on these species regionally.

The impact of the proposed operation on the rare species known to be present or which might be present will be very small. The only specific impact which may occur is if there are nesting mounds of the Malleefowl present. This needs to be examined further once the exact lay out of the mine is known so that any mounds can be avoided. The presence of the Malleefowl may require referral under the EPBC Act, but this species can be managed adequately.

The limited number of rare vertebrate fauna species occurring on the site or expected to occur is the result of the poor quality of the grazed habitat available and the abundance of the habitats regionally. The rare species listed are mainly birds which are scarce but widespread, and they would make only limited or occasional use of the site considered here.

The landforms and vegetation units are common and widespread in the region. There has been no detailed mapping regionally, but Beard (1976) has mapped the regional vegetation at a scale of 1:1,000,000. Botanically the area is right on the boundary of the South-West and Eremaean Botanical Districts (Beard 1990). Locally the South-west is represented by the Jibberding System which is characterised by Acacias on sandplain, woodlands on heavier soils and salt lakes. The Eremaean part is in the Austin District which is in the Murchison Region lying on the Yilgarn Block, but represented locally by the distinctive Yalgoo Sub-region. The Yalgoo is transitional where Mulga has dropped out and been replaced by other species. The scrubs are more diverse than in the true Mulga areas, and there are woodlands, scattered stony hills and salt lakes. The site agrees well with this regional description.

Most of the disturbance will be in the stony hills, sandplain, York Gum woodland and salt lake.

Virtually the entire area is or has been held under pastoral leases and has been heavily affected by long-term grazing of sheep and goats, although this will have affected the thickets and sandplain less than the woodlands, shrublands and salt lakes. There has also been extensive timber cutting for fences. Feral animals are present. Grazing and these other impacts since European settlement have resulted in a reduction of the flora and vegetation, and an even greater impact on the native fauna.

The habitats are widely replicated both locally and regionally, and there are no unique habitat features. Consequently no high conservation values can be given to the site on the basis of the landforms, vegetation and fauna habitats present.

The site is relatively remote and is in an area with a traditional land use of pastoral grazing, along with occasional mineral exploration and mining. The site has no particular local or regional values, and it has no other land use which would conflict with mining.

In total, limited conservation values can be assigned to the site in either a local or regional context because:

- There are few rare species and the only one which might be affected significantly is the Malleefowl if nest mound are present.
- The fauna habitats are common locally and regionally, and are generally in poor condition.
- The site is remote, has no unique or unusual features, has no past or presently proposed conservation status, and has no other incompatible use which can be anticipated.

Although no high values can be assigned to the site, all native vegetation has conservation value which derives from aesthetics and as species habitat. Native vegetation areas should always be protected or rehabilitated as far as practicable, and recommendations for achieving this are made below.

The feral animals present on the site cannot be controlled in any useful way on a local scale.

6. RECOMMENDATIONS.

While the site has limited conservation values derived from the fauna, the general conservation values associated with the native vegetation should be recognised and protected where possible. The environmental management of the proposed mining should include:

- Keeping a watch for nesting mounds of the Malleefowl.
- Disturbing as little land as possible, and limiting the disturbance of the native vegetation by good design and management.
- Avoiding the less common habitats by disturbing more common habitats if possible, although there are no unique habitat features and no specific actions which need to be taken in relation to the fauna.
- Retaining all topsoil, including any topsoil from sites to be buried, and segregating the topsoil from different vegetation types.
- Conserving all vegetation material for use in rehabilitation.
- Rehabilitating disturbed areas as far as possible and as quickly as possible in accordance with standard ecologically based procedures of slope control, sub-soil selection, ripping, topsoil placement and return of vegetation material.

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APPENDIX 1. Descriptions of the trapping sites. The locations are shown in Map 1.

SITE 1.

Location: 6723620 515940.

Soil: Red-brown sandy loam.

Topographic position: Flat plain.

Vegetation:

STRATUM	COVER	HEIGHT
Eucalypts: mainly York Gum, with scattered <i>Callitris columellaris</i>	5%, patchy	3-10m
Shrubs	<10%	0.5-2.5m
Ground cover	<1%	<0.3m
Bare ground, litter only under shrubs	>70%	

Notes:

Vegetation in poor condition.

Not burnt for many years

SITE 2A.

Location: 6724080 518230.

Soil: Brown clay with pale creamy gypsum rises.

Topographic position: Salt lake.

Vegetation:

STRATUM	COVER	HEIGHT
Samphires	10%	<0.5m
Grasses/herbs only on gypsum	0-30%	<0.2m

SITE 2B.

Location: 6724080 518230.

Soil: Red-brown, fine, very stony with almost 100% cover.

Topographic position: Low stony slope.

Vegetation:

STRATUM	COVER	HEIGHT
Shrubs: mainly Acacias with Eremophila, Scaevola spinescens and Olearia	10%, patchy	0.5-3m
Ground cover	1%	<0.3m
Bare ground, litter only under shrubs	>70%	

Notes:

Vegetation in poor condition.

Not burnt for many years

SITE 3.

Location: 6725900 520050.

Soil: Red sandy loam.

Topographic position: Flat plain.

Vegetation:

STRATUM	COVER	HEIGHT
York Gum	5-10%	Most <8m, to 12m
Shrubs: mainly Acacias with legumes, Olearia	<20%	0.5-3m
Ground cover	1%	<0.3m
Bare ground, litter only under shrubs	>70%	

Notes:

Vegetation in poor condition.

Not burnt for many years.

Many logs present.

Stands of Callitris nearby

SITE 4.

Location: 6728700 516710.

Soil: Red-brown loam.

Topographic position: Low point in flat plain.

Vegetation:

STRATUM	COVER	HEIGHT
Scattered eucalypts and <i>Callitris columellaris</i>	1%	Most <7m, to 12m
Shrubs: <i>Acacias</i> , <i>Melaleucas</i> Low shrubs very sparse	70%	3m
Ground cover	<1%	<0.3m
Bare ground, litter high (50%)	50%	

Notes:

Vegetation in poor condition.

Not burnt for many years

SITE 5.

Location: 6728230 517820.

Soil: Red-brown, fine, gravelly, with almost 100% gravel cover.

Topographic position: Slope of hill.

Vegetation:

STRATUM	COVER	HEIGHT
Shrubs: mainly sheoaks with some melaleucas and Acacias	>70%	2-3m
Low shrubs	<5%	1m
Ground cover	<1%	<0.3m
Bare ground, litter abundant (90%)	10%	

Notes:

Vegetation in poor condition.

Not burnt for many years

Trees very rare

SITE 6.

Location: 6728430 515460.

Soil: Red-brown, skeletal, fine, very stony, over massive rock.

Topographic position: Hill top.

Vegetation:

STRATUM	COVER	HEIGHT
Shrubs: sheoaks, Acacias, Melaleucas, Grevillea	50-100%	1.5-2m
Low shrubs: legumes, myrtles	<5%, patchy	1m
Ground cover	<1%	<0.3m
Bare ground, litter very high (50-100%)	0-30% where rocks	

Notes:

Vegetation in poor condition.

Not burnt for many years

Trees very rare, only on lower edges

SITE 7.

Location: 6727840 515790.

As for site 6 but exposed rocks more common. Trees completely absent.

SITE 8.

Location: 6727980 515080.

Soil: Yellow sand.

Topographic position: Flat sandplain.

Vegetation:

STRATUM	COVER	HEIGHT
Shrubs: mainly Acacias with Sheoak, Hakea, Grevillea	>70%	3m
Low shrubs: mainly Rutaceae	0-20%	0.5-1m
Ground cover	<1%	<0.3m
Bare ground, litter very high (70%)	<30%	

Notes:

Vegetation very dry.

Not burnt for some years

SITE 9.

Location: 6725890 515540.

Soil: Yellow sand.

Topographic position: Flat sandplain.

Vegetation:

STRATUM	COVER	HEIGHT
Mallees	5%	5m
Shrubs: mainly Acacias	70%	2m
Low shrubs: mainly Rutaceae	10%	0.5-1m
Ground cover	<1%	<0.3m
Bare ground, litter high (50%)	<50%	

Notes:

Vegetation very dry.

Not burnt for some years

APPENDIX 2. List of the vertebrate fauna species which may occur on the site, in the following habitats:

- W. Woodlands and shrublands on loamy soils.
- St. Stony and gravelly hills with shrublands.
- Sa. Sandplain with mallees and shrublands.
- La. Samphire flats or fringe of lakes (clay or gypsum).

Introduced species are identified by an asterisk (*).

		W	St	Sa	La
A. FROGS					
HYLIDAE					
<i>Cyclorana maini</i>	Main's Frog	X		X	
<i>Cyclorana platycephala</i>	Water-holding Frog	X		X	
MYOBATRACHIDAE					
<i>Neobatrachus aquilonius</i>	Northern Burrowing Frog	X		X	
<i>Neobatrachus kunapalari</i>	Kunapalari Frog	X		X	
<i>Neobatrachus pelobatoides</i>	Humming Frog	X		X	
<i>Neobatrachus sutor</i>	Shoemaker Frog	X		X	
<i>Neobatrachus wilsmorei</i>	Wilsmore's Burrowing Frog	X		X	
<i>Pseudophryne guentheri</i>	Guenther's Toadlet	X		X	
<i>Pseudophryne occidentalis</i>	Western Toadlet	X	X	X	
B. REPTILES					
GEKKONIDAE					
<i>Crenadactylus o. ocellatus</i>	Ocellated Clawless Gecko	X		X	
<i>Diplodactylus g. granariensis</i>	Wheatbelt Gecko	X			
<i>Diplodactylus maini</i>	Main's Gecko	X		X	
<i>Diplodactylus pulcher</i>	Beautiful Gecko	X	X	X	
<i>Diplodactylus squarrosus</i>	Crowned Gecko		X		
<i>Gehyra variegata</i>	Variegated Dteila	X	X	X	
<i>Heteronotia binoei</i>	Binoe's Prickly Gecko	X	X	X	X
<i>Nephrurus vertebralis</i>	Striped Knob-tail		X		
<i>Oedura reticulata</i>	Reticulated Velvet Gecko	X			
<i>Rhynchoedura ornata</i>	Beaked Gecko	X	X	X	
<i>Strophurus assimilis</i>	Goldfield's Spiny-tailed Gecko	X	X	X	X
<i>Strophurus strophurus</i>	Hidden Bar-tailed Gecko	X	X	X	
<i>Underwoodisaurus milii</i>	Barking Gecko	X	X		
PYGOPODIDAE					
<i>Delma australis</i>	Southern Delma	X		X	
<i>Delma fraseri</i>	Fraser's Delma	X		X	
<i>Delma tineta</i>	Tinted Delma	X	X	X	
<i>Lialis burtonis</i>	Burton's Legless Lizard	X	X	X	X
<i>Pygopus lepidopodus</i>	Southern Scaly-foot	X		X	
<i>Pygopus n. nigriceps</i>	Hooded Scaly-foot	X	X	X	X

		W	St	Sa	La
AGAMIDAE					
<i>Ctenophorus inermis</i>	Central Netted Dragon	X		X	
<i>Ctenophorus maculatus griseus</i>	Grey Spotted Dragon			X	
<i>Ctenophorus reticulatus</i>	Reticulated Dragon	X	X	X	
<i>Ctenophorus salinarum</i>	Saltlake Dragon			X	X
<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon	X	X	X	
<i>Moloch horridus</i>	Thorny Devil			X	
<i>Pogona m. minor</i>	Western Bearded Dragon	X	X	X	X
SCINCIDAE					
<i>Cryptoblepharus carnabyi</i>	Carnaby's Crypto	X			
<i>Cryptoblepharus plagiocephalus</i>	Common Crypto	X		X	
<i>Ctenotus mimetes</i>	Mimic Ctenotus	X		X	
<i>Ctenotus p. pantherinus</i>	Western Leopard Ctenotus	X	X	X	X
<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus	X		X	
<i>Ctenotus severus</i>	Austere Ctenotus		X		
<i>Ctenotus u. uber</i>	Coin Ctenotus		X		
<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink	X	X	X	
<i>Egernia formosa</i>	Goldfield's Crevice Skink	X		X	
<i>Egernia inornata</i>	Inornate Desert Skink			X	X
<i>Egernia stokesii badia</i>	Western Spiny-tailed Skink	X			
<i>Eremiascincus richardsoni</i>	Broad-banded Sand Swimmer	X	X	X	X
<i>Lerista distinguenda</i>	Southwestern Four-toed Lerista			X	
<i>Lerista gerrardii</i>	Gerrard's Lerista	X		X	
<i>Lerista m. macropisthopus</i>	Common Brown Lerista	X	X	X	
<i>Lerista muelleri</i>	Mueller's Three-toed Lerista	X	X	X	X
<i>Lerista nichollsi</i>	Nicholl's Broad striped Lerista		X	X	
<i>Menetia greyii</i>	Grey's Menetia	X	X	X	X
<i>Morethia butleri</i>	Butler's Morethia	X	X	X	
<i>Morethia obscura</i>	Dark Morethia	X		X	X
<i>Tiliqua occipitalis</i>	Western Bluetongue	X	X	X	X
<i>Tiliqua r. rugosa</i>	Western Bobtail	X	X	X	X
VARANIDAE					
<i>Varanus caudolineatus</i>	Line-tailed Monitor	X		X	
<i>Varanus giganteus</i>	Perentie	X	X	X	X
<i>Varanus gouldii</i>	Bungarra	X	X	X	X
<i>Varanus tristis</i>	Black-tailed Monitor	X		X	
TYPHLOPIDAE					
<i>Ramphotyphlops australis</i>	Southern Blind Snake	X		X	X
<i>Ramphotyphlops hamatus</i>	Western Blind Snake	X	X	X	X
<i>Ramphotyphlops waitii</i>	Waite's Blind Snake	X	X	X	X

		W	St	Sa	La
BOIDAE					
<i>Antaresia s. stimsoni</i>	Stimson's Python	X	X	X	X
<i>Aspidites ramsayi</i>	Woma	X	X	X	X
<i>Morelia spilota imbricata</i>	Southwest Carpet Python	X	X	X	
ELAPIDAE					
<i>Acanthophis pyrrhus</i>	Desert Death Adder	X	X	X	X
<i>Brachyuropsis s. semifasciatus</i>	Southern Shovel-nosed Snake	X		X	
<i>Demansia psammophis reticulata</i>	Grey-headed Whip Snake	X	X	X	X
<i>Furina ornata</i>	Red-naped Snake	X	X	X	X
<i>Parasuta gouldii</i>	Gould's Snake	X	X	X	X
<i>Parasuta monachus</i>	Monk Snake	X	X	X	X
<i>Pseudechis australis</i>	Mulga Snake	X	X	X	X
<i>Pseudonaja modesta</i>	Ringed Brown Snake	X	X	X	X
<i>Pseudonaja nuchalis</i>	Gwardar	X	X	X	X
<i>Simoselaps bertholdi</i>	Jan's Banded Snake	X	X	X	
<i>Simoselaps bimaculatus</i>	Black-naped Snake	X	X	X	
<i>Simoselaps f. fasciolatus</i>	Narrow-banded Snake			X	X
<i>Suta fasciata</i>	Rosen's Snake	X	X	X	X
C. BIRDS		1	2	3	4
CASUARIIDAE					
<i>Dromaius novaehollandiae</i>	Emu	X	X	X	X
MEGAPODIIDAE					
<i>Leipoa ocellata</i>	Malleefowl	X	X	X	
PHASIANIDAE					
<i>Coturnix pectoralis</i>	Stubble Quail				X
ACCIPITRIDAE					
<i>Elanus axillaris</i>	Black-shouldered Kite	X	X	X	X
<i>Lophoictinia isura</i>	Square-tailed Kite	X	X	X	X
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	X	X	X	X
<i>Milvus migrans</i>	Black Kite	X	X	X	X
<i>Haliastur sphenurus</i>	Whistling Kite	X	X	X	X
<i>Circus assimilis</i>	Spotted Harrier		X	X	X
<i>Accipiter fasciatus</i>	Brown Goshawk	X	X	X	X
<i>Accipiter cirrhocephalus</i>	Collared Sparrowhawk	X	X	X	X
<i>Aquila audax</i>	Wedge-tailed Eagle	X	X	X	X
<i>Hieraaetus morphnoides</i>	Little Eagle	X	X	X	X

		W	St	Sa	La
FALCONIDAE					
<i>Falco berigora</i>	Brown Falcon	X	X	X	X
<i>Falco longipennis</i>	Australian Hobby	X	X	X	X
<i>Falco hypoleucos</i>	Grey Falcon	X	X	X	X
<i>Falco subniger</i>	Black Falcon	X	X	X	X
<i>Falco peregrinus</i>	Peregrine Falcon	X	X	X	X
<i>Falco cenchroides</i>	Nankeen Kestrel	X	X	X	X
OTIDIDAE					
<i>Ardeotis australis</i>	Australian Bustard	X	X	X	
TURNICIDAE					
<i>Turnix velox</i>	Little Button-quail	X	X	X	
<i>Turnix varia</i>	Painted Button-quail	X	X	X	
BURHINIDAE					
<i>Burhinus grallarius</i>	Bush Stone-curlew	X	X	X	
GLAREOLIDAE					
<i>Glareola maldivarum</i>	Oriental Pratincole	X	X	X	X
COLUMBIDAE					
<i>Phaps chalcoptera</i>	Common Bronzewing	X	X	X	
<i>Ocyphaps lophotes</i>	Crested Pigeon	X	X	X	X
<i>Geopelia cuneata</i>	Diamond Dove	X	X	X	X
CACATUIDAE					
<i>Calyptrorhynchus banksii</i>	Red-tailed Black-Cockatoo	X			
<i>Cacatua roseicapilla</i>	Galah	X	X	X	X
<i>Cacatua sanguinea</i>	Little Corella	X			
<i>Cacatua leadbeateri</i>	Pink Cockatoo	X			
<i>Nymphicus hollandicus</i>	Cockatiel	X	X	X	X
PSITTACIDAE					
<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet	X		X	
<i>Polytelis anthopeplus</i>	Regent Parrot	X		X	
<i>Barnardius zonarius</i>	Australian Ringneck	X	X	X	X
<i>Psephotus varius</i>	Mulga Parrot	X	X	X	
<i>Melopsittacus undulatus</i>	Budgerigar	X	X	X	X
<i>Neopsephotus bourkii</i>	Bourke's Parrot	X	X	X	
<i>Neophema elegans</i>	Elegant Parrot	X			
<i>Neophema splendida</i>	Scarlet-chested Parrot	X	X	X	X

		W	St	Sa	La
CUCULIDAE					
<i>Cuculus pallidus</i>	Pallid Cuckoo	X	X	X	X
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	X	X	X	X
<i>Chrysococcyx basalis</i>	Horsfield's Bronze-Cuckoo	X	X	X	X
<i>Chrysococcyx lucidus</i>	Shining Bronze-Cuckoo	X	X	X	X
STRIGIDAE					
<i>Ninox novaeseelandiae</i>	Southern Boobook	X		X	
TYTONIDAE					
<i>Tyto novaehollandiae</i>	Masked Owl	X			
<i>Tyto alba</i>	Barn Owl	X			
PODARGIDAE					
<i>Podargus strigoides</i>	Tawny Frogmouth	X		X	
CAPRIMULGIDAE					
<i>Eurostopodus argus</i>	Spotted Nightjar	X	X	X	X
AEGOTHELIDAE					
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	X		X	
APODIDAE					
<i>Apus pacificus</i>	Fork-tailed Swift	X	X	X	X
HALCYONIDAE					
<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher	X		X	
<i>Todiramphus sanctus</i>	Sacred Kingfisher	X		X	
MEROPIDAE					
<i>Merops ornatus</i>	Rainbow Bee-eater	X		X	
CLIMACTERIDAE					
<i>Climacteris affinis</i>	White-browed Treecreeper	X		X	
<i>Climacteris rufa</i>	Rufous Treecreeper	X			
MALURIDAE					
<i>Malurus splendens</i>	Splendid Fairy-wren	X	X	X	X
<i>Malurus lamberti</i>	Variegated Fairy-wren	X	X	X	X
<i>Malurus pulcherrimus</i>	Blue-breasted Fairy-wren	X	X	X	X
<i>Malurus leucopterus</i>	White-winged Fairy-wren			X	X

		W	St	Sa	La
PARDALOTIDAE					
<i>Pardalotus striatus</i>	Striated Pardalote	X		X	
ACATHIZIDAE					
<i>Sericornis frontalis</i>	White-browed Scrubwren	X	X	X	
<i>Calamanthus campestris</i>	Rufous Fieldwren			X	
<i>Hylacola cauta</i>	Shy heathwren			X	
<i>Pyrrholaemus brunneus</i>	Redthroat	X	X	X	
<i>Smicrornis brevirostris</i>	Weebill	X		X	
<i>Gerygone fusca</i>	Western Gerygone	X		X	
<i>Acanthiza apicalis</i>	Inland Thornbill	X	X	X	
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	X	X	X	
<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill	X	X	X	
<i>Acanthiza iredalei</i>	Slender-billed Thornbill				X
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	X	X	X	
<i>Aphelocephala leucopsis</i>	Southern Whiteface	X	X	X	
MELIPHAGIDAE					
<i>Anthochaera carunculata</i>	Red Wattlebird	X		X	
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	X	X	X	
<i>Manorina flavigula</i>	Yellow-throated Miner	X	X	X	
<i>Lichenostomus virescens</i>	Singing Honeyeater	X	X	X	X
<i>Lichenostomus leucotis</i>	White-eared Honeyeater	X		X	
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater	X		X	
<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater	X		X	
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	X		X	
<i>Lichmera indistincta</i>	Brown Honeyeater	X	X	X	
<i>Phylidonyris albifrons</i>	White-fronted Honeyeater	X	X	X	
<i>Certhionyx niger</i>	Black Honeyeater	X	X	X	
<i>Certhionyx variegatus</i>	Pied Honeyeater	X	X	X	
<i>Ephthiamura tricolor</i>	Crimson Chat		X	X	X
<i>Ephthiamura aurifrons</i>	Orange Chat				X
<i>Ephthiamura albifrons</i>	White-fronted Chat				X
PETROICIDAE					
<i>Microeca fascians</i>	Jacky Winter	X			
<i>Petroica goodenovii</i>	Red-capped Robin	X	X	X	
<i>Melanodryas cucullata</i>	Hooded Robin	X	X	X	
<i>Eopsaltria griseogularis</i>	Western Yellow Robin			X	
<i>Drymodes brunneopygia</i>	Southern Scrub-robin			X	
POMATOSTOMIDAE					
<i>Pomatostomus superciliosus</i>	White-browed Babbler	X	X	X	

		W	St	Sa	La
CINCLOSOMATIDAE					
<i>Psophodes occidentalis</i>	Chiming Wedgebill		X	X	
<i>Cinclosoma castanotus</i>	Chestnut Quail-thrush	X	X	X	
<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush	X	X	X	
NEOSITTIDAE					
<i>Daphoenositta chrysoptera</i>	Varied Sittella	X			
PACHYCEPHALIDAE					
<i>Oreoica gutturalis</i>	Crested Bellbird	X	X	X	
<i>Pachycephala inornata</i>	Gilbert's Whistler	X			
<i>Pachycephala pectoralis</i>	Golden Whistler			X	
<i>Pachycephala rufiventris</i>	Rufous Whistler	X	X	X	
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	X	X	X	
DICRURIDAE					
<i>Myiagra inquieta</i>	Restless Flycatcher	X			
<i>Grallina cyanoleuca</i>	Magpie-lark	X			X
<i>Rhipidura fuliginosa</i>	Grey Fantail	X	X	X	
<i>Rhipidura leucophrys</i>	Willie Wagtail	X	X	X	X
CAMPEPHAGIDAE					
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	X		X	
<i>Coracina maxima</i>	Ground Cuckoo-shrike		X		X
<i>Lalage sueurii</i>	White-winged Triller	X		X	
ARTAMIDAE					
<i>Artamus personatus</i>	Masked Woodswallow	X	X	X	X
<i>Artamus superciliosus</i>	White-browed Woodswallow	X	X	X	X
<i>Artamus cinereus</i>	Black-faced Woodswallow	X	X	X	X
<i>Artamus cyanopterus</i>	Dusky Woodswallow	X	X	X	X
<i>Cracticus torquatus</i>	Grey Butcherbird	X	X	X	
<i>Cracticus nigrogularis</i>	Pied Butcherbird	X	X	X	
<i>Gymnorhina tibicen</i>	Australian Magpie	X	X	X	X
<i>Strepera versicolor</i>	Grey Currawong	X		X	
CORVIDAE					
<i>Corvus coronoides</i>	Australian Raven	X	X	X	X
<i>Corvus bennetti</i>	Little Crow	X	X	X	X
<i>Corvus orru</i>	Torresian Crow	X	X	X	X
PTILONORHYNCHIDAE					
<i>Chlamydera guttata</i>	Western Bowerbird	X			

		W	St	Sa	La
MOTACILLIDAE					
<i>Anthus novaeseelandiae</i>	Richard's Pipit				X
PASSERIDAE					
<i>Taeniopygia guttata</i>	Zebra Finch	X	X	X	X
DICAEIDAE					
<i>Dicaeum hirundinaceum</i>	Mistletoebird	X		X	
HIRUNDINIDAE					
<i>Cheramoeca leucosternum</i>	White-backed Swallow			X	
<i>Hirundo neoxena</i>	Welcome Swallow	X	X	X	X
<i>Hirundo nigricans</i>	Tree Martin	X	X	X	X
<i>Hirundo ariel</i>	Fairy Martin	X	X	X	X
SYLVIIDAE					
<i>Cinclorhamphus mathewsi</i>	Rufous Songlark	X			
<i>Cinclorhamphus cruralis</i>	Brown Songlark			X	X
ZOSTEROPIDAE					
<i>Zosterops lateralis</i>	Silvereye	X	X	X	
D. MAMMALS					
TACHYGLOSSIDAE					
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	X	X	X	X
DASYURIDAE					
<i>Antechinomys laniger spenceri</i>	Kultarr			X	
<i>Sminthopsis c. crassicaudata</i>	Fat-tailed Dunnart	X	X	X	X
<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart	X	X	X	
<i>Sminthopsis gilberti</i>	Gilbert's Dunnart	X	X	X	
<i>Sminthopsis granulipes</i>	White-tailed Dunnart			X	
<i>Sminthopsis macroura froggatti</i>	Stripe-faced Dunnart	X	X	X	
MACROPODIDAE					
<i>Macropus fuliginosus</i>	Western Grey Kangaroo	X	X	X	X
<i>Macropus robustus</i>	Euro		X		
<i>Macropus rufus</i>	Red Kangaroo	X	X	X	X
EMBALLONURIDAE					

<i>Taphozous hilli</i>	Hill's Sheathtail-bat	X	X	X	X
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		W	St	Sa	La
MOLOSSIDAE					
<i>Mormopterus planiceps</i>	Southern Freetail-bat	X	X	X	X
<i>Nyctinomus australis</i>	White-striped Freetail-bat	X	X	X	X
VESPERTILIONIDAE					
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	X	X	X	X
<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat	X	X	X	X
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	X	X	X	X
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	X	X	X	X
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	X	X	X	X
MURIDAE					
<i>Notomys mitchellii</i>	Mitchell's Hopping-mouse			X	
<i>Pseudomys albocinereus</i>	Ashy-grey Mouse			X	
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	X	X	X	
* <i>Mus musculus</i>	House Mouse	X	X	X	X
CANIDAE					
* <i>Canis lupus dingo</i>	Dingo	X	X	X	X
* <i>Vulpes vulpes</i>	Fox	X	X	X	X
FELIDAE					
* <i>Felis catus</i>	Feral Cat	X	X	X	X
LEPORIDAE					
* <i>Oryctolagus cuniculus</i>	Rabbit	X		X	X
BOVIDAE					
* <i>Capra hircus</i>	Feral Goat	X	X	X	X