Appendix 7: Matsu Project Gouldian Finch Nest Hollow Assessment (APM 2014b)

Kimberley Metals Group Pty Ltd: Matsu Project

GOULDIAN FINCH NEST HOLLOW ASSESMENT

July 2014

ANIMAL PLANT MINERAL

This report was completed for Kimberley Metals Group Pty Ltd

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Disclaimer

EXECUTIVE SUMMARY

Animal Plant Mineral Pty Ltd was engaged by Kimberley Metals Group Pty Ltd in July 2014 to undertake a tree hollow assessment constituting breeding habitat of the Gouldian Finch (*Erythrura gouldiae*). The survey was carried out in early July 2014 at two sites: The Deposit Development Envelope and the Access Track Development Envelope. These sites occur within the Matsu Project area, located in the East Kimberley Region of Western Australia, approximately 165km south of Wyndham adjacent to the Great Northern Highway.

Based on the ecology related to nest-site selection, Gouldian Finches readily utilise artificial nest hollows. Therefore, where there are disturbances to potential nest sites from clearing, breeding in an area can continue successfully provided that key resources, such as nest hollows, proximity to feeding grounds and water are maintained. The Matsu project may potentially impact 150ha of native vegetation of which approximately 28.75ha has been determined to be Gouldian Finch breeding habitat.

Twenty one randomised 50m x 50m quadrats were selected within Gouldian Finch breeding habitat. The survey quadrats were randomised within the breeding habitat to reduce potential bias for sampling of larger, more mature trees. Trees bearing the parameters meeting Gouldian Finch nesting hollow requirements were identified and inspected. Measurements of nest hollow diameter and height above ground were recorded for each hollow. General notes on Gouldian Finch habitat suitability and water sources were also recorded.

The total area inspected amounted to 5.25ha in each site. Two trees containing a total of four suitable nesting hollows were located in the Deposit Development Envelope and six trees bearing a total of ten suitable nesting hollows were located in the Access Track Development Envelope. This equates to an average of 0.76 potential nest hollows per hectare in the Deposit Development Envelope and 1.9 potential nest hollows per hectare in the Access Track Development Envelope.

Ground truthing revealed that the local and regional area may be classified as feeding habitat, however when the habitat is mapped according to land systems, the Matsu Project footprint will only impact approximately 0.01% of available feeding habitat.

At least two potential permanent water sources were located and a number of ephemeral water sources that exist during the breeding season and well into the dry season were identified. It is recommended that adequate planning is incorporated into the Project's ongoing environmental management to ensure no impact to these water sources. Kimberley Metals Group has recently developed a Dust Management Plan and Erosion and Sediment Control Management Plan, the implementation of which will contribute significantly to the protection of Gouldian Finch habitat.

The number of nest boxes required to contribute effectively to offsetting clearing, is directly proportional to the area being cleared and the number of potential hollows that are lost to clearing. Approximately 76% of the 14km total length of the access track is considered suitable breeding habitat and the density of nest hollows was calculated to be 1.9 hollows per hectare. Therefore a total of 51 nest boxes are required to be installed to offset the impact of clearing a 25m wide corridor for construction of the access track.

The Gouldian Finch breeding habitat in the Deposit Development Envelope was considered to be of low value, with only 0.76 hollows per hectare recorded which is less than half of the density recorded in the Access Track Development Envelope and the Ridges Iron Ore Project area and monitoring to date has revealed that this species does not use the ridgeline for breeding. Therefore no nest boxes are proposed for installation within the Matsu Deposit Development Envelope.

To offset the disturbance associated with clearing at the Matsu Project, it is recommended that the nest boxes are constructed along a similar design to the nest boxes at the Ridges Iron Ore Project and be placed in groups

of 20. It is recommended that all of the nest boxes be placed throughout the low rolling hills on the plains due to greater nest hollow density, suitable water sources and good feeding habitat as evidenced by the two flocks of juveniles. In addition, the nest boxes will be monitored annually during the breeding season (between March and May) in line with the current nest box program at the Ridges Iron Ore Project.

The exact location for the nest boxes can only be determined once the final access track alignment is determined. A disturbance inventory will be undertaken as clearing for the Project progresses which will enable an exact calculation of the nest boxes required.

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1 INTRODUCTION

Kimberley Metals Group Pty Ltd (**KMG**) operates the Ridges Iron Ore Project (**RIOP**) located approximately 165km south of Wyndham adjacent to the Great Northern Highway in the East Kimberley Region of Western Australia. The RIOP produces 1.5 to 2.0 million tonnes of iron ore fines per annum. KMG is currently mining two ore bodies at the RIOP known as Sam and Tony. To maintain continuous feed as the Sam and Tony deposits near completion, KMG is now proposing to develop a satellite ore body known as the Matsu deposit; located approximately 10km south-southeast of the existing RIOP mine site. The Matsu Project (**Matsu**) consists of three Development Envelopes: the Access Track Development Envelope (**ATDE**), the Processing Development Envelope (**PDE**) and the Deposit Development Envelope (**DDE**). The total area of disturbance to native vegetation is presently estimated to be less than 150 hectares (ha).

The Gouldian Finch is listed as Endangered according to the *Environment Protection and Biodiversity Conservation Act 1999* (Cth); however, it has recently been removed from the threatened species list (Schedule 1/Endangered) (*Wildlife Conservation Act 1950* (WA)) based on the assessment undertaken by Birdlife Australia for the Action Plan for Australian Birds 2010.

Gouldian Finches, (*Erythrura gouldiae)*, are distributed throughout WA in the Kimberley region. Locally to the Matsu Project, three individuals were sighted 14.6km north of the northern extent of the Matsu deposit and 5.3km north of the current RIOP pits by *ecologia* in 2005. Several populations of Gouldian Finch have been sighted at Argyle Diamond Mine over several years by amateur ornithologist Frank O'Connor (O'Connor 2005 unpublished). However, no details are available on numbers or location of individuals recorded over this 10 year period of opportunistic recording. Two individuals were observed on the Argyle camp lawn in June 2011, which is located 11.03 km east of Matsu (M. Ladyman pers. obs.). Populations of the Gouldian Finch have been reported in at RIOP in 2012 and 2014, near the accommodation village.

Gouldian Finch breeding habitat is characterised by rocky hills with hollow-bearing smooth-barked gums, *Eucalyptus brevifolia* or *Corymbia dichromphloia* within two to four kilometres of small waterholes or springs that persist throughout the dry season (O'Malley 2006). Gouldian Finches are obligate hollow nesters and require robust and deep hollows with small diameters (Tidemann et al. 1999, Brazill-Boast et al. 2010). During the nesting period they rely on feeding habitat within 1km of the nest site. Throughout this time Gouldian Finches predominantly feed on spear grass or native sorghum (e.g. *Sarga* spp., *Sorghum stipoideum, S. intrans* and *S. plumosum*) and spinifex (e.g. *Triodia bitextura*, *T. acutispicula*, *T. bynoei* and *T. schinzii*) (Dostine and Franklin 2002, Pryke 2010).

As a result of clearing native vegetation, the primary impact of loss of hollow-bearing trees that may be used for nesting by Gouldian Finches may be partially offset by the provision of artificial nest hollows. Studies have demonstrated that the provision of artificial nest boxes can stimulate reproduction, initiate earlier breeding and increase fledging in wild populations. Brazill-Boast *et al*. (2013) shows that the provision of nest boxes for Gouldian Finches leads to earlier nesting, larger clutches and a greater fledgling rate. Increase in breeding densities can be up to 240% greater than natural hollow nesting populations, with 338% increased fledging. Thus nest boxes are an important part of management and recovery of this species, and are custom built to satisfy the niche requirements of Gouldian Finches.

To offset the impact associated with clearing for the RIOP a nest box program was initiated in 2011 to be ready for the 2012 breeding season. To date 165 nest boxes have been installed at eight sites at the RIOP (60 installed in 2011, 60 installed in 2013 and 45 installed in 2014). Of the 165 installed, 15 have been destroyed by either fire or termites. Gouldian Finches have most recently been observed using at least two of the artificial nest boxes installed by APM for RIOP, with a total of nine chicks observed during the 2014 nest box monitoring program.

This report addresses the potential for disturbance to Gouldian Finch breeding habitat that may arise from the proposed Matsu Project and suggests management and amelioration actions to minimise that disturbance. Clearing of hollows has been identified as the most relevant impact to Gouldian Finches in the development of the Project.

2 METHODS

Two sites were assessed for Gouldian Finch nest hollows:

- Deposit Development Envelope; and
- Access Track Development Envelope

Both sites occurred on sloping rocky hills and were dominated by open *Eucalyptus* and/or *Corymbia* woodland over sorghum and/or spinifex species. The PDE was assessed and determined to be unsuitable Gouldian Finch breeding habitat.

Twenty one 50m x 50m quadrats were randomly chosen across each of the sites within representative breeding habitat (Figure 2-1). The figure shows the access track corridor at a width of 100m, however, it is anticipated that the impact footprint width will be no greater than 25m. The exact location of the sampling quadrats was randomised to reduce sampling bias for hollow-bearing trees within the general breeding habitat. The total area covered at each survey site was 5.25ha. APM Biologists inspected all the *Eucalyptus* and *Corymbia* trees within each quadrat and assessed the potential of hollows using binoculars. All trees that supported hollows within the required parameters were marked with flagging tape; hollows were required to have an entry aperture diameter between 25 and 100mm and have a cavity surrounded by thick and robust timber. A 4.5m extendable ladder was then ascended to closely assess all hollows that were accessible. Hollows that were too high were assessed using a GoPro camera mounted on an extendable pole. Where a suitable nest hollow was found the diameter of the aperture, the height of the hollow above the ground and the type of tissue into which the hollow had formed (i.e. living or dead) was recorded. The data collected was then used to calculate the average number of potential nest sites per hectare.

Notes were also taken during ground-truthing of the Development Envelopes of breeding habitat quality, feeding habitat quality and water locations in the local area.

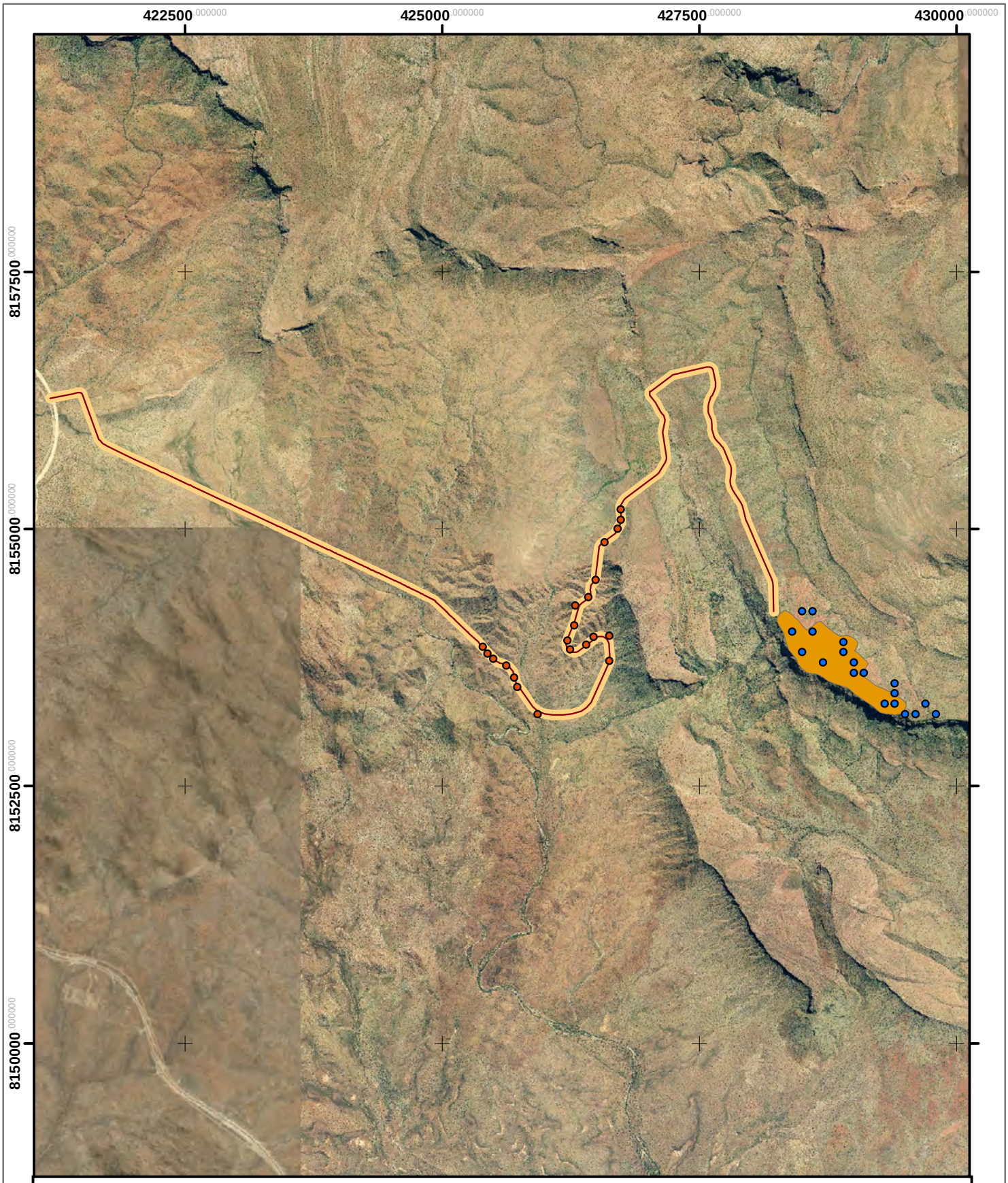

Figure 2-1: Gouldian Finch Nest Hollow Assessment Quadrats in the Matsu Deposit Development Envelope and the Access Track Development Envelope

Legend

- *Access Track Development Envelope Quadrats*
- *Deposit Development Envelope Quadrats*
- *Access Track Development Envelope*
- *Matsu Deposit Development Envelope*

1:50,000

0 ½ 1 2

Kilometers

Author: TS Date: 22/07/2014

3 RESULTS

3.1 NEST HOLLOW ASSESSMENT

Twenty one quadrats of 50m X 50m were surveyed in each site amounting to a 5.25ha survey area in each site (Figure 2-1). The DDE contained two hollow bearing trees with a total of four Gouldian Finch appropriate nest hollows. The ATDE contained six hollow bearing trees with a total of ten Gouldian Finch appropriate nest hollows.

Table 3-1 and Table 3-2 provide a results summary of the sites assessed, including the number of suitable trees, the number of potential nesting hollows and the measurements of the potential nesting hollows in each quadrat.

Table 3-1: Details of all the quadrats assessed within the Deposit Development Envelope

Site	Quadrat Number	Hollow bearing trees in quadrat	Gouldian appropriate hollows per tree	Diameter of hollow (mm)	Height of hollow (m)	Hollow/tree tissue relationship
Deposit Development Envelope	MTA01	0				
	MTA02	0				
	MTA03	0				
	MTA04	0				
	MTA05	0				
	MTA06	0				
	MTA07	0				
	MTA08	0				
	MTA09	0				
	MTA10	0				
	MTA11	0				
	MTA12	0				
	MTA13	0				
	MTA14	Tree 1	Hollow 1	90	2.7	Dead
	MTA15	0				
	MTA16	0				
	MTA17	0				
	MTA18	0				
	MTA19	0				
	MTA20	0				
	MTA21	Tree 2	Hollow 1	50	3.8	Living
			Hollow 2	60	3.6	Dead into living
			Hollow 3	60	2.6	Dead into living
Total		**2**	**4**			
Average Per Hectare		**0.38**	**0.76**			

Table 3-2: Details of all the quadrats assessed within the Access Track Development Envelope

Site	Quadrat Number	Hollow bearing trees in quadrat	Gouldian appropriate hollows per tree	Diameter of hollow (mm)	Height of hollow (m)	Hollow/tree tissue relationship
Access Track Development Envelope	HTA04	0				
	HTA05	0				
	HTA06	0				
	HTA08	0				
	HTA012	Tree 1	Hollow 1	25	3.9	Living
			Hollow 2	25	3.8	Living
			Hollow 3	25	4.2	Living
	HTA15	0				
	HTA17	0				
	HTA19	0				
	HTA21	Tree 2	Hollow 1	100	5.2	Dead
			Hollow 2	70	6.5	Dead into living
	HTA22	0				
	HTA24	0				
	HTA25	0				
	HTA26	Tree 3	Hollow 1	25	3.7	Living
			Hollow 2	40	2.5	Dead into living
		Tree 4	Hollow 1	40	2.4	Living
	HTA28	0				
	HTA31	0				
	HTA35	Tree 5	Hollow 1	25	3.3	Living
		Tree 6	Hollow 1	40	3.7	Living
	HTA36	0				
	HTA38	0				
	HTA40	0				
	HTA41	0				
	HTA42	0				
Total		**6**	**10**			
Average Per Hectare		**1.14**	**1.9**			

The ATDE contained the highest quality breeding habitat (Plate 1) with a density of approximately 1.9 suitable nest hollows per hectare while the DDE had approximately 0.76 suitable nest hollows per hectare thus representing much lower quality breeding habitat (Plate 2).

Plate 1: Typical habitat found in the Access Track Development Envelope

Plate 2: Typical habitat found in the Deposit Development Envelope

3.2 BREEDING HABITAT

Breeding habitat distribution was ground truthed along the ATDE and was mapped (Figure 3-1). Mapping was completed to a corridor width of 100m, despite the impact width only being 25m.

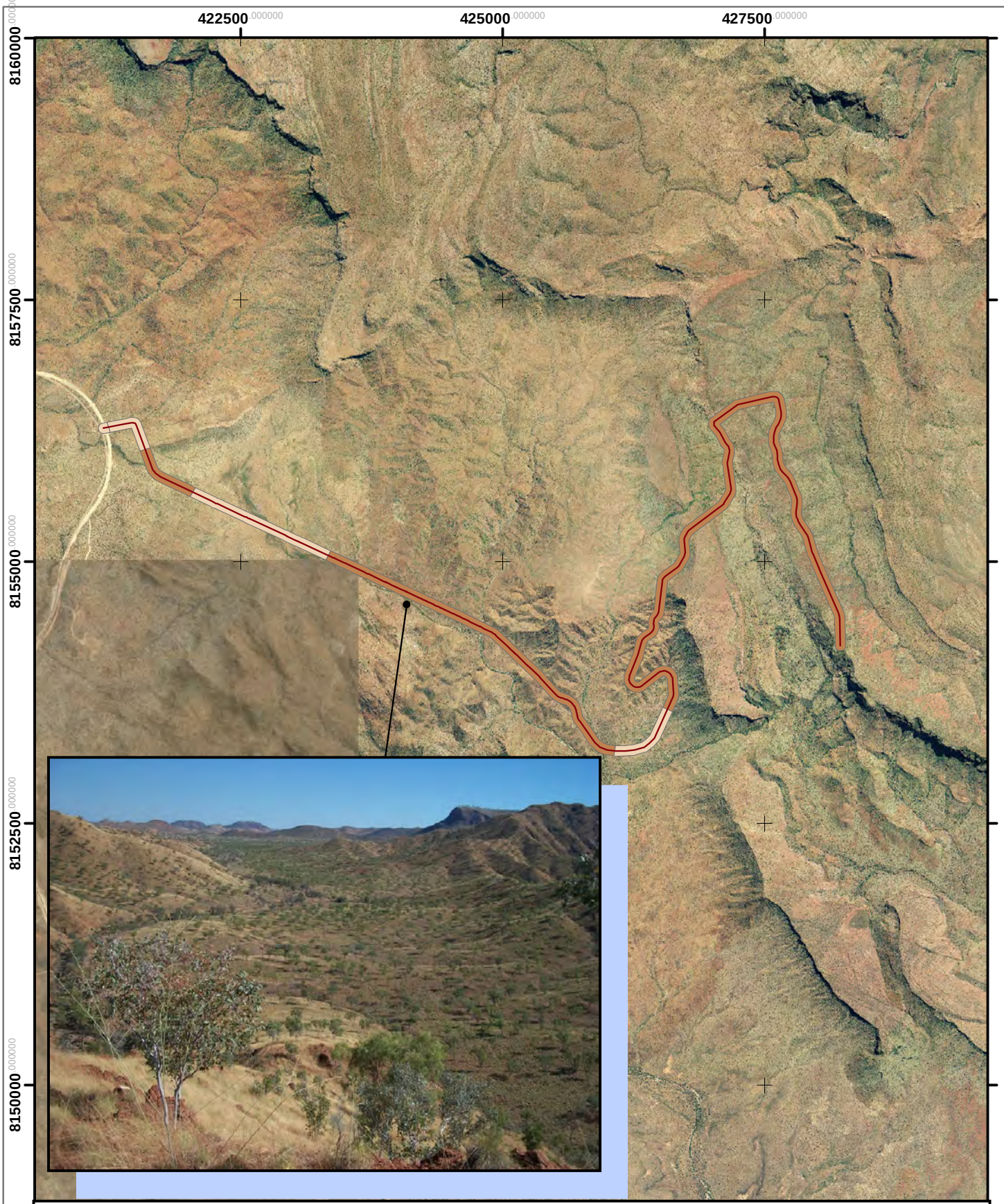

Figure 3-1: Gouldian Finch Breeding Habitat Distribution Along Access Track Development Envelope

Legend

- *Non-breeding Habitat*
- *Breeding Habitat*

1:50,000

0 ½ 1 2

Kilometers

Author: TS Date: 22/07/2014

3.3 FEEDING HABITAT

The areas surveyed and the greater surrounding landscape represent feeding habitat for the Gouldian Finch. Mapping placed the Project in the following land systems:

- Pompeys
- McPhee
- Wickham
- Dockrell

Combining the area of each of the land systems listed above, the total area, which likely represents Gouldian feeding habitat, is 1,438,369ha. The disturbance to these land systems and by extension, feeding habitat, as a result of the Project is estimated to be 150ha. Thus approximately only 0.01% of available feeding habitat in the region may be affected due to clearing associated with the Project. This result is likely an over estimation of impact to feeding habitat because feeding habitat also exists in other land systems in the region which have not been taken into account in this calculation.

During the ground-truthing, two flocks of approximately 15 juvenile Gouldian Finches with approximately two adults present were sighted in two different locations, 2.25km and 2.5km west north-west of the northern extent of the Matsu deposit (1: 426308E, 8155076S; 2: 425883E, 8152249S) (Plate 3).

Plate 3: Juvenile and adult Gouldian Finch observed during the survey

3.4 WATER SOURCES

There are a number of ephemeral pools in a creek following a north/south alignment and which bisects the ATDE. While they are ephemeral, these pools exist throughout the breeding season. Additionally four water pools were identified that likely hold water all year round. Water source locations are shown on (Figure 3-2).

There are no pools within the DDE that are likely to hold water throughout the breeding season. However, the DDE still occurs in close proximity to pools located on the surrounding plain.

415000.000000 417500.000000 420000.000000 422500.000000 425000.000000 427500.000000 430000.000000 432500.000000 435000.000000

8160000.000000
8157500.000000
8155000.000000
8152500.000000
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8147500.000000

Figure 3-2: Observed Water Sources in RIOP Matsu Vicinity

1:57,912

Legend

- Matsu Water Sources
- *Access Track Development Envelope*
- *Matsu Deposit Development Envelope*

0 ½ 1 2

Kilometers

Author: TS Date: 22/07/2014

4 DISCUSSION

Within the Matsu Project area, the ATDE site contains the most suitable breeding habitat with hollow densities exceeding those of DDE by more than double. The ATDE had a similar nesting hollow density as was recorded during the RIOP nest hollow survey (approximately 1.94 nest hollows per hectare) in 2010 (APM, 2010) while the DDE site had younger and thinner trees with less suitable nesting hollows. Although the majority of the habitat at both sites consisted of *Eucalyptus* and *Corymbia* open woodland on stony slopes, the ATDE had a greater number of larger, more mature trees. In general *Eucalyptus* species will only start producing hollows after 80 years (Ambrose 1982) and as such hollow density is directly related to the distribution of trees of a suitable age and size.

The number of nest boxes required, to contribute effectively to offsetting clearing, is directly proportional to the area of suitable breeding habitat being cleared and the number of hollows that are lost to clearing.

Approximately 76% of the total length of the access track is considered suitable breeding habitat (i.e. supporting suitable hollows in close proximity to water and feeding habitat) and it is anticipated that the construction impact footprint will be 25m wide. As the access track is 14km long, a total of 26.6ha of nesting habitat is likely to be cleared. As the density of nest hollows along the ATDE was calculated to be 1.9 hollows per hectare a total of 51 nest boxes are required to be installed to offset the impact of clearing for the access track.

The Gouldian Finch breeding habitat in the DDE was considered to be of low value, with only 0.76 hollows per ha recorded which is less than half of the density recorded in the ATDE and in the RIOP area. Moreover, none of the nest boxes installed on top of the ridge at RIOP have ever been utilised by Gouldian Finches and only one individual has ever been recorded on the ridge. The data suggest that Gouldian Finch do not utilise the ridgeline for breeding. Therefore no nest boxes are proposed for installation within the Matsu DDE.

To offset the disturbance associated with clearing at the Matsu Project, it is recommended that the nest boxes are constructed along a similar design to the nest boxes at the RIOP and be placed in groups of 20. It is recommended that all of the nest boxes be placed throughout the low rolling hills on the plains due to greater nest hollow density, suitable water sources and good feeding habitat as evidenced by the two flocks of juveniles. In addition, the nest boxes will be monitored annually during the breeding season (between March and May) in line with the current nest box program at the RIOP.

The exact locations of the sites for nest box installation are yet to be determined as it is essential that they are chosen in the best habitat available adjacent to or distant from clearing. Furthermore, a disturbance inventory will be undertaken as clearing for the Project progresses which will enable an exact calculation of the nest boxes required once the exact area of breeding habitat disturbed is known.

Feeding habitat is widespread in the Kimberley and anticipated disturbance to this habitat due to the Project represents a small proportion of available feeding habitat. However usability of the feeding habitat is closely aligned with available water. The feeding habitat in the area local to the Project is considered to be good due to the availability of water well into the dry season with at least four permanent water sources. It is important that adequate planning is incorporated into the Project's ongoing environmental management to ensure the least amount of impact to these water sources. KMG have recently developed a Dust Management Plan and Erosion and Sediment Control Management Plan, the implementation of which will contribute significantly to the protection of Gouldian Finch habitat.

5 REFERENCES

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Appendix 8: Matsu Level 1 Biological Survey (APM 2014c)

LEVEL 1 BIOLOGICAL SURVEY

MATSU IRON ORE DEPOSIT

AND ACCESS TRACK

EAST KIMBERLEY, WESTERN AUSTRALIA

June 2013

BIOLOGICAL SURVEY OF THE RIGDES IRON ORE PROJECT
MATSU DEPOSIT

ANIMAL PLANT MINERAL

Prepared by Animal Plant Mineral Pty Ltd for Kimberley Metals Group Ltd

KMG032 – Kimberley Metals Group Ltd. Level 1 Biological Survey of Matsu

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EXECUTIVE SUMMARY

In May 2012, Kimberley Metals Group Ltd commissioned Animal Plant Mineral Pty Ltd to provide a Level 1 flora and vegetation survey and a Level 1 fauna survey of the Matsu Iron Ore Deposit and the Matsu Access Track which leads from the existing Ridges Iron Ore Project Mine Site to the Matsu Project area in the East Kimberley region of Western Australia.

The Level 1 flora and vegetation assessment comprised a desktop assessment of all relevant information of value in describing the floristic attributes of the Matsu Deposit, the Access Track and the immediate surrounds. The desktop assessment was augmented with some ground-truthing field survey work done by helicopter and foot traverses. During the field survey significant effort was focussed on the search for Rare / Priority Flora and Priority / Threatened Ecological Communities.

The desktop assessment and ground survey identified the occurrence of seven plant communities within, and surrounding, the Matsu Deposit and Access Track. Two of these communities are listed as Priority Ecological Communities by the Department of Environment and Conservation. Plant Assemblages on Vertical Sandstone Surfaces were located within the boundaries of the Matsu Deposit and near to the Access Track. Monsoon Vine Thickets were not found within the boundaries of the Project area, however, they were found in close proximity.

A total of 137 taxa (species, subspecies and varieties) from 45 families and 96 genera were recorded in the course of the field survey of the Matsu Deposit. No flora of conservation significance, pursuant to subsection 2 of section 23F of the *Wildlife Conservation Act 1950* (WA) and no plant taxa pursuant to section 179 of the *Environment Protection Biodiversity Conservation Act 1999* (Cth) were located in the Matsu Project area.

There were eight priority taxa as defined by the Department of Environment and Conservation located during the field survey. These were Priority 1 species *Corymbia cadophora* subsp. *polychroma, Jacquemontia* sp. Keep River (J.L. Egan 5051) and *Triodia cremnophila*, Priority 2 species *Eucalyptus ordiana*, Priority 3 species *Brachychiton tridentatus*, Priority 4 species *Grevillia minuata,* and *Kunzea* sp. Keep River and *Triodia s*p. Argyle (aff. cunninghamii) which is currently being nominated for priority status.

Of the 137 taxa recorded in the Matsu Deposit four were introduced (weed) species. These were **Calotropis procera, * Cenchrus americanus, *Melinis repens* and **Passiflora foetida*. Both **Calotropis procera* and **Passiflora foetida* are classified as 'invasive' under the Invasive Plant Prioritisation Process (DEC 2012b) with medium and high ecological impact respectively.

The Level 1 terrestrial fauna assessment comprised a desktop assessment of all relevant information of value in describing the fauna and fauna habitat values of the Matsu Deposit, the Access Track and the immediate surrounds. In addition, a targeted field survey of the Matsu Deposit was undertaken that recorded bird and bat species richness and the potential presence of Northern Quoll *Dasyurus hallucatus*.

The desktop survey produced a list of 244 vertebrate fauna species (118 birds, 34 mammals, 74 reptiles, 18 amphibians) that could potentially occur in the Matsu Project area, eight of which are protected under the *Environment Protection and Biodiversity Conservation Act*, the *Wildlife Conservation Act* or are a declared Priority species by the Department of Environment and Conservation. The field survey of the Matsu Deposit identified 44 bird species, 10 bat species and four non-volant mammal species. No Northern Quoll were recorded during the targeted survey. Three conservation significant species were recorded during the field surveys (Rainbow Bee-eater, Orange Leafnosed-bat and Ghost Bat) and a further five are expected to occur in the project area (Fork-tailed Swift, Gouldian Finch, Pictorella Mannikin, Peregrine Falcon and Northern Leafnosed-bat).

When data from fauna surveys conducted across the Ridges Iron Ore Project and neighbouring Argyle Diamond Mine are taken into account a total of 96.5% of the expected fauna species have been recorded in the local area surrounding the Matsu Deposit and the Access Track.

Four distinct fauna habitats were recorded in the Matsu Project area. The fauna habitats that were identified in the Project area represent common features of the Wickham Land System. The clearing of the Project area represents a habitat loss of 0.5% for the local area and a habitat loss of 0.02% for the regional area. Therefore the Project is expected to only have a minor impact on the fauna habitat available in the region.

Due to the relatively small clearing areas the Matsu Project is expected to have only a minor impact on the regional population of common species in the area. Conservation significant species like the Rainbow Bee-eater, Fork-tailed Swift and Pictorella Mannikin all use the Matsu Project area as foraging habitat and, as such, will suffer negligible to minor impact due to limited habitat loss.

The Matsu Project area was identified as possible Gouldian Finch breeding habitat as it consists of smooth-barked *Corymbia* and *Eucalyptus* species on rocky hills with a grassy understorey. The clearing of the Matsu Project area would therefore result in a small decrease in potential breeding habitat for this species. Kimberley Metals Group Ltd is currently undertaking an artificial nest box program to offset the loss of natural tree hollows removed during current operations. Artificial nest boxes are readily used by Gouldian Finches and are known to increase breeding density and fecundity. Therefore, the local population of Gouldian Finches is not expected to be negatively impacted by the Matsu Project.

The Peregrine Falcon, Orange Leafnosed-bat, Northern Leafnosed-bat and Ghost Bat all potentially utilise the cliff faces in the Matsu Deposit as nesting or roosting habitat. The construction and operations of the Matsu Project should not interfere with these species as mining will occur on the back slope, leaving the cliff face untouched. The noise and light disturbance created by the Matsu Project is unlikely to displace the bats as experience from other locations have shown that they remain present in areas that have mid to high levels of human activity.

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PROJECT DEFINITIONS

Project Terminology	Meaning
Matsu Access Track (the Access Track)	Historical access track leading to the Matsu Project area from the existing Tony Pit at the Ridges Iron Ore Project Mine Site
Matsu Deposit	Matsu Iron Ore Deposit
Matsu Project area (the Project)	Matsu Iron Ore Deposit and Matsu Access Track
RIOP	Ridges Iron Ore Project

ABBREVIATIONS

Abbreviation	Meaning
Aff.	Affiliated
APM	Animal Plant Mineral Pty Ltd
CAMBA	China and Australian Migratory Bird Agreement 1986
Cth	Commonwealth
DEC	Department of Environment and Conservation
DRF	Declared Rare Flora
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EP Act	*Environmental Protection Act 1986* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
JAMBA	Japan and Australian Migratory Bird Agreement 1974
KMG	Kimberley Metals Group Pty Ltd
MNES	Matters of National Environmental Significance
N:	Northing
NVIS	National Vegetation Information System
NW	North West
P1-4	Priority Species
PEC	Priority Ecological Community
S	South
RIOP	Ridges Iron Ore Project
sp.	Species (Unspecified)
subsp.	Sub-species
SW	South West
TEC	Threatened Ecological Community
var.	Variety
W	West
WA	Western Australia
WC Act	*Wildlife Conservation Act 1950* (WA)

SYMBOLS AND UNITS

Symbols and Units	Meaning
*	Introduced plant species
+	Plus
%	Percentage
° ’ ”	Degrees, Minutes, Seconds
>	More than
C.	Circa
ha	Hectare
km	Kilometre
km^2	Square Kilometre
m	Metre
mm	Millimetre

1 INTRODUCTION

1.1 LOCATION AND SCOPE OF WORK

Animal Plant Mineral Pty Ltd (APM) was engaged by Kimberley Metals Group Pty Ltd (KMG) to provide a Level 1 flora, vegetation survey and terrestrial vertebrate fauna survey of the Matsu Iron Ore Deposit (Matsu Deposit) and the associated access track (Access Track) that connects the Matsu Deposit to the existing Ridges Iron Ore Project (RIOP) Mine Site. Collectively, the deposit and access track are referred to hereafter as the Project. The RIOP Mine Site is located approximately 165 km south of Wyndham adjacent to the Great Northern Highway in the East Kimberley Region of Western Australia (WA) (Figure 1-1).

The Matsu Deposit covers 112.6 hectares (ha) and is located in KMG Lease areas E80/2389, P80/1750 and E80/4309. The Access Track, which is approximately 18 kilometres (km) long and four metres (m) wide, covers an area of 7.2 ha and follows the alignment of a historical track along the ridgeline. The Access Track traverses KMG Lease areas E80/2389 and M80/600 and the western edge of the M 259SA Lease, which is held by Argyle Diamonds Limited, a subsidiary of Rio Tinto Limited. A letter of authority has been obtained from Rio Tinto Limited (KMG 2012) that permits KMG to work on the Access Track in lease M 259SA.

This biological survey includes:

- A desktop assessment that considers all relevant information of value in describing the flora, vegetation, terrestrial vertebrate fauna and fauna habitat values of the Matsu Deposit, the Access Track and the immediate surrounds.
- Searches of the following on-line databases:
    - The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (*EPBC Act*) Protected Matters database to identify Matters of National Environmental Significance (MNES)
    - The Department of Environment and Conservation (DEC):
      - Threatened Ecological Communities (TECs) database
      - Priority Ecological Communities (PECs) database
      - Threatened (Declared Rare) and Priority Flora database
      - Threatened and Priority Flora List
      - Threatened and Priority Fauna List
- A Level 1 flora and vegetation survey of the Matsu Deposit
- A Level 1 terrestrial vertebrate fauna survey of the Matsu Deposit, including census for bird, acoustic recording for bats and targeted trapping for Northern Quoll.

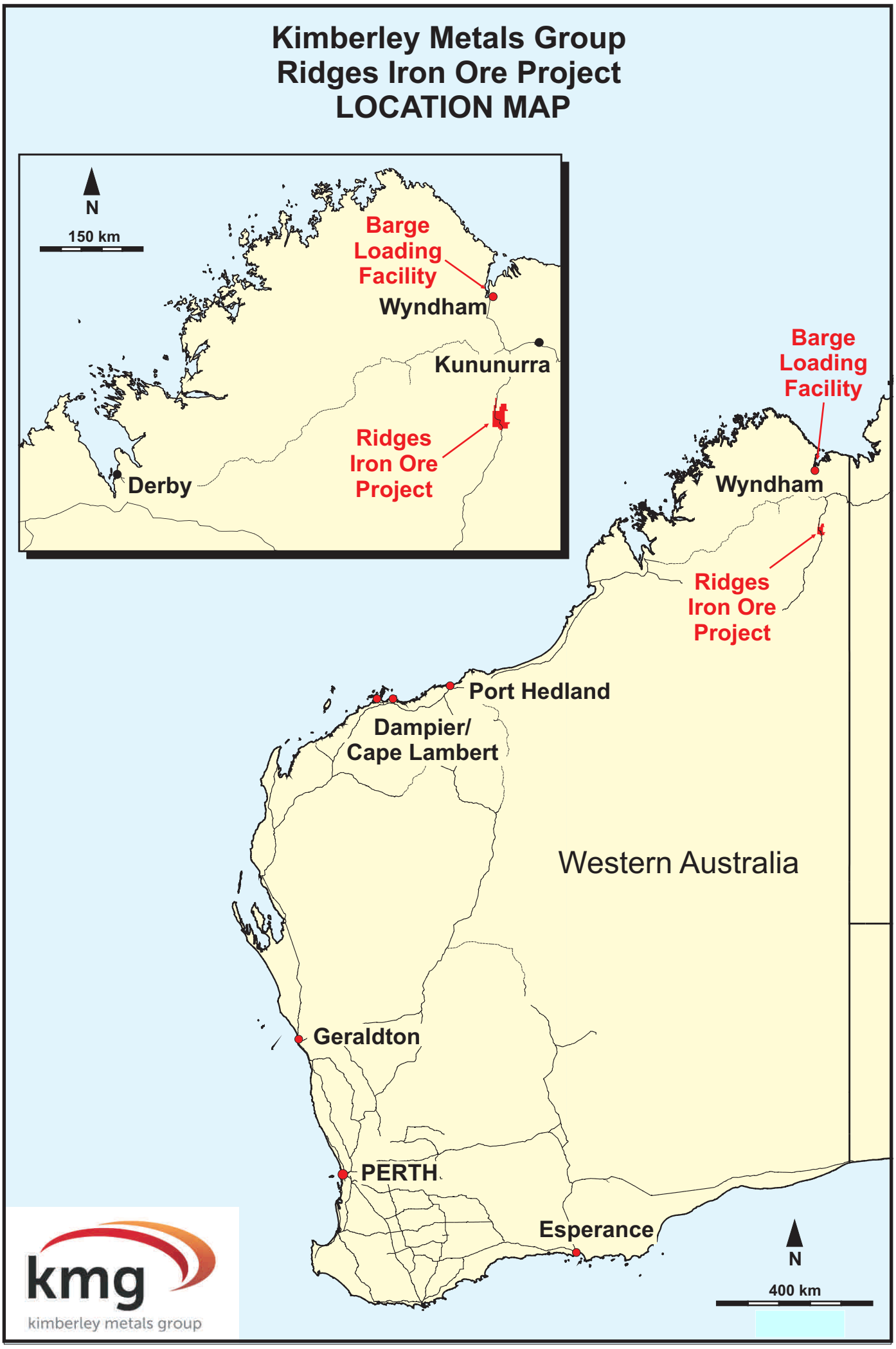
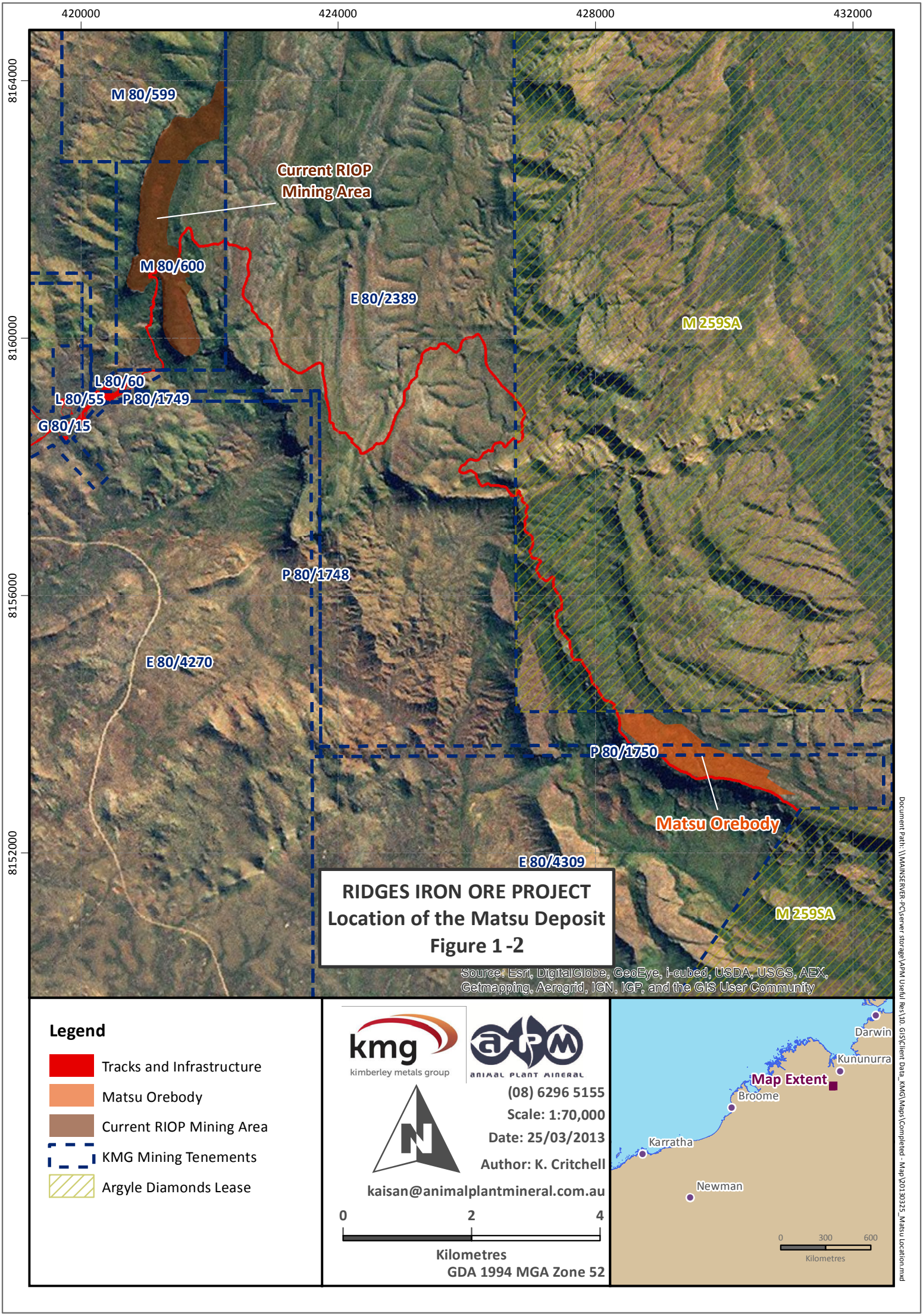


Figure 1-1: General Location Map


420000
424000
428000
432000
8164000
8160000
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8152000
M 80/599
Current RIOP
Mining Area
M 80/600
E 80/2389
M 259SA
L 80/60
L 80/55
P 80/1749
G 80/15
P 80/1748
E 80/4270
P 80/1750
Matsu Orebody
E 80/4309
M 259SA
RIDGES IRON ORE PROJECT
Location of the Matsu Deposit
Figure 1 -2
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
Legend
Tracks and Infrastructure
Matsu Orebody
Current RIOP Mining Area
KMG Mining Tenements
Argyle Diamonds Lease
kmg
kimberley metals group
apm
animal plant mineral
(08) 6296 5155
Scale: 1:70,000
Date: 25/03/2013
Author: K. Critchell
kaisan@animalplantmineral.com.au
0
2
4
Kilometres
GDA 1994 MGA Zone 52
Darwin
Kununurra
Map Extent
Broome
Karratha
Newman
0
300
600
Kilometres
Document Path: \\MAINSERVER-PC\server storage\APM Useful Res\10. GIS\Client Data_KMG\Maps\Completed - Map\20130325_Matsu Location.mxd

1.2 SUPPORTING INFORMATION

Species considered to be of national conservation significance are protected under the *EPBC Act*; under this Act, activities that may have a significant impact on a species of national conservation significance must be referred to the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) for assessment. In WA, all native fauna species are protected under the *WC Act*; fauna species that are considered rare, threatened with extinction or have high conservation value are specially protected by four schedules in this Act (see Appendix 1). The DEC also classifies some other fauna under five different priority codes (Appendix 1).

In addition, some species of fauna are covered under the 1991 *Australian and New Zealand Environment Conservation Council* (*ANZECC*) *Convention* (Cth), while certain birds are listed under the 1974 *Japan and Australian Migratory Bird Agreement* (*JAMBA*) (Cth) and the 1986 *China and Australian Migratory Bird Agreement* (*CAMBA*) (Cth). More recently Australia and the Republic of Korea agreed to develop a bilateral migratory bird agreement similar to the *JAMBA* and *CAMBA*. The *Republic of Korea-Australian Migratory Bird Agreement* (*ROKAMBA*) was entered into force in 2007. All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as MNES under the *EPBC Act*.

Flora may be afforded rare or priority status when they are known only from a small number of populations, and when at least some of those populations are deemed to be under threat. Threatened Flora (T) are protected under section 23F of the *WC Act,* and it is an offence to "take" Rare Flora without ministerial permission. Section 23F defines "to take" as "…to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means." Flora and Threatened Ecological Communities (TEC's) considered to have national conservation significance are also listed under the *EPBC Act,* and may not be damaged or destroyed without the permission of the Federal Minister for the Environment. Possible TEC's that do not meet survey criteria or that are not adequately defined, are added to DEC's Priority Ecological Community (PEC) list, so that consideration can be given to their declaration as TEC's. Definitions of conservation codes are provided in Appendix 1.

2 EXISTING ENVIRONMENT

2.1 PHYSICAL ENVIRONMENT

2.1.1 Climate

The climate for the Project area is described as dry, hot tropical and semi-arid with a mean annual precipitation of > 590mm during a summer wet season from December to March inclusive. Meteorological data from the Argyle Aerodrome weather station, which is approximately 14 km south east of the Matsu Project area, is presented in Figure 2-1 and is indicative of the climatic conditions experienced on the site.

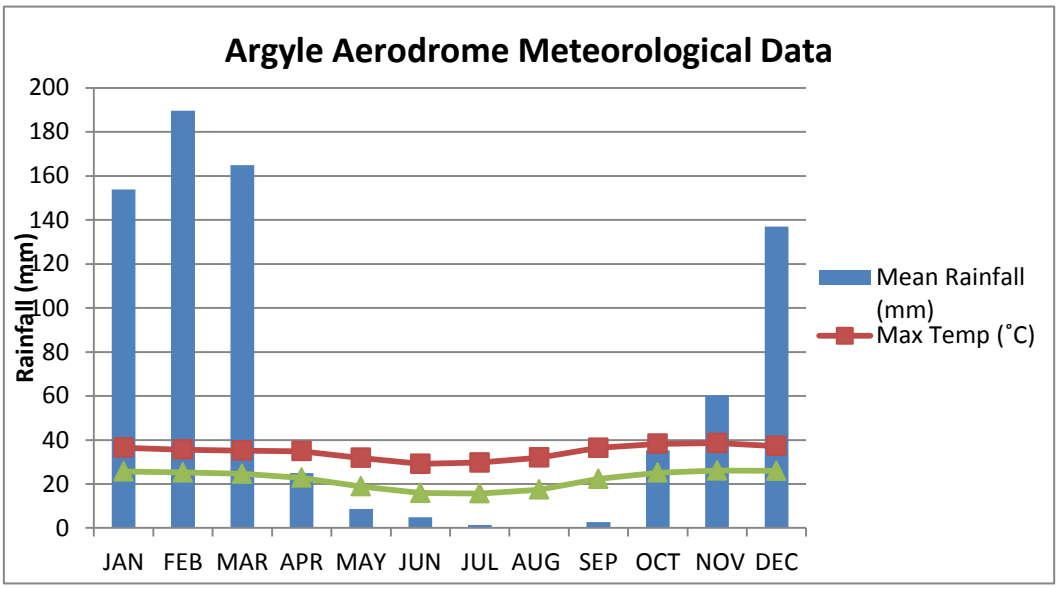

Figure 2-1: Mean Monthly Rainfall and Temperature from the Argyle Aerodrome Weather Station (Australian Bureau of Meteorology 2012)

2.1.2 Geology and Soils

The iron ore mineralisation, which is the focus of the RIOP, is located within Proterozoic rocks (ca: 1.2 billion years old) of the Carr Boyd Ranges, forming part of the Carr Boyd Group, which is a complex package of sandstone, ferruginous sandstone, siltstone and mudstone. The Carr Boyd Ranges extend in a north to north-easterly direction from the Argyle Diamond Mine to Kununurra, a total distance of approximately 115 km within the Kimberley region of WA (100 km North of the RIOP and 15 km South), and cover an area of approximately 3000 square km.

Soils consist of shallow stony sand and loam soils on harder siliceous rocks and neutral red earths and red loams or grey and brown cracking clays on volcanics and limestone (Beard 1990).

2.1.3 Bioregions and Systems

The Interim Biogeographic Regionalisation for Australia (IBRA) divides Australia into bioregions on the basis of climate, geology, landforms, vegetation and fauna (Thackway and Cresswell 1995). The mapping completed by Beard (1975) provides the basis for the IBRA bioregions. IBRA (version 6.1) mapping places Matsu Project area within the Ord Victoria Plain bioregion.

The Ord Victoria Plain is found in northern WA and the Northern Territory (NT) and covers much of the upper catchments of the Ord and Victoria River systems. It includes ridges, plateaus and undulating plains with scattered mesas and buttes. Vegetation consists mainly of *Eucalyptus* woodlands over hard/soft spinifex and annual grasslands (SEWPaC 2012a). The region includes Purnululu (Bungle Bungle) National Park in WA, part of the Gregory National Park in the NT and the Argyle Diamond Mine (Australian Government 2012).

The Rangeland Land System Mapping for Western Australia dataset (Department of Agriculture and Food, 2009) was consulted to further facilitate a broad assessment of the regional representation of vegetation that occurs in the Project area. A land system is defined as 'an area or group of areas, throughout which there is a recurring pattern of topography, soils and vegetation'. The Wickham and Pompey land systems were mapped within the Project area. The Matsu Deposit and approximately half of the Access Track lie within the Wickham Land System and the other half of the Access Track lies within the Pompey Land System. These two land systems are characterised by Payne and Schoknecht (2011) as:

Wickham: Rugged plateaux, ridges and hills formed on sedimentary rocks supporting snappy gum low woodland over soft or curly spinifex.

Pompey: Rugged granite country with sandy soils occurring as a number of small areas in the north-western parts of the area.

3 METHODOLOGY

3.1 CONTRIBUTING AUTHORS

The flora and vegetation field work and taxonomic component of this survey was undertaken by Kimberley Botanist and Taxonomist Dr Russell Barrett. The associated reporting was undertaken by APM Senior Botanist Brian Vincent.

The bird survey was undertaken by Kimberley expert ornithologist Mr George Swann with the assistance of APM Senior Ecologist Dr Margot Oorebeek, whom also conducted the Northern Quoll survey. R. D. Bullen of Bat Call WA completed analysis of echolocation recordings to determine bat species present. The associated reporting was undertaken by Dr Margot Oorebeek.

3.2 PREVIOUS BIOLOGICAL SURVEYS

Several previous biological surveys have been undertaken in the East Kimberley region. Surveys in the vicinity of the Matsu Deposit and Access Track from which data have been reviewed and included in this report include:

- APM (2012) Baseline Fauna Survey for area north of Sam deposit (unpublished)
- APM (2011) Baseline Fauna Survey of the Argyle Diamond Mine and Proposed Conservation Reserve. Environmental Impact Assessment survey undertaken for Argyle Diamonds.
- APM (2010) Ridges Iron Ore Flora and Vegetation Survey of Proposed Mine and Infrastructure Impact areas. Environmental Impact Assessment survey undertaken for Kimberley Metals Group.
- APM (2010) Ridges Iron Ore Wet Season Echolocation Survey of Bat Activity. Environmental Impact Assessment survey undertaken for Kimberley Metals Group.
- APM (2009) Ridges Iron Ore Mine Site Fauna Assessment Survey. Environmental Impact Assessment survey undertaken for Kimberley Metals Group.
- APM (2009) Ridges Iron Ore Gouldian Finch Nest Assessment. Environmental Impact Assessment survey undertaken for Kimberley Metals Group.
- Ecologia (2005) Argyle Iron Ore Project. Flora and Fauna survey undertaken for Resource Mining Corporation

Other relevant surveys that have occurred at nearby sites include:

- APM (2010) Speewah Vanadium Project Biological Survey. Environmental Impact Assessment Survey undertaken for Speewah Metals Limited. Approximately 50km north west of RIOP
- Harold 1981 – Argyle Diamond Mine approximately 20 km south east of RIOP
- Biostat 2001 – Argyle Diamond Mine approximately 20 km south east of RIOP
- Biostat 2002– Argyle Diamond Mine approximately 20 km south east of RIOP
- Frank O'Connor's (previous Argyle employee and birdwatcher) records– Argyle Diamond Mine approximately 20 km south east of RIOP

3.3 DESKTOP METHODOLOGY

3.3.1 Flora and Vegetation

Prior to commencing the flora and vegetation field survey of the Matsu Project area, a number of desktop searches were undertaken for both the Project area.

A search of MNES protected under the *EPBC Act* was undertaken using the Protected Matters Search Tool (SEWPaC 2012b). This search covered the Project area using a polygon including a 10 km buffer (coordinates: -16.60564, 128.23663; -16.59255, 128.3104; -16.71747, 128.4408; -16.73651, 128.33657; -16.6681, 128.26281; -16.60564, 128.23723; -16.60564, 128.23663). The report produced details listed threatened flora and TEC's, wetlands of international importance, world heritage properties and national heritage places and is presented in Appendix 2.

A request was made for a search of the DEC databases for threatened and priority flora and consideration was given to the presence of any TEC's or PEC's. This search was conducted using a spot location (NW 16° 18' 30"S; 128° 14' 55"E; SW 16° 48' 0.6"S; 128° 34' 44"E) approximately 10 km from the Matsu Project area. A 20 km buffer area was used for this search which adequately encompasses the Project area; the results are presented in Table 4-1.

The Project area and was also assessed in the context of regional and national vegetation mapping programs carried out by Beard (1975) and the IBRA Program (Australian Government 2012).

A search for environmentally sensitive areas, as declared by a Notice under section 51B of the *Environmental Protection Act 1986* (WA) (*EP Act*), and areas where low impact mineral and petroleum activities cannot occur, as defined under Schedule 1 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, was undertaken using the Native Vegetation Map Viewer (DEC 2012a).

3.3.2 Fauna

A search of terrestrial vertebrate fauna MNES protected under the *EPBC Act* was undertaken using the Protected Matters Search Tool (SEWPaC 2012b). This search covered the Project area using a polygon including a 10 km buffer (coordinates: -16.60564, 128.23663; -16.59255, 128.3104; -16.71747, 128.4408; -16.73651, 128.33657; -16.6681, 128.26281; -16.60564, 128.23723; -16.60564, 128.23663). The report is presented in Appendix 2.

A request was made for a search of the DEC databases for threatened and priority fauna. This search was conducted using a spot location (NW 16° 18' 30"S; 128° 14' 55"E; SW 16° 48' 0.6"S; 128° 34' 44"E) approximately 10 km from the Matsu Project area. A 20 km buffer area was used for this search which adequately encompasses the Project area; the results are presented in Table 4-4.

In addition, a search of APM's in-house database, containing records from the most recent and nearby fauna surveys, was used to identify fauna most likely to occur in the rocky ridge habitat of the Matsu Deposit and the Access Track. The species list generated using this selective approach is considered to contain the fauna most likely to occur in the Project area.

Other more general texts were also used to provide supplementary information on vertebrates in the bioregion, including Storr *et al*. (1983, 1990, 1999, 2002) for reptiles, Johnstone and Storr (1998, 2004) for birds and Van Dyck and Strahan (2008) for mammals.

3.4 FIELD SURVEY

3.4.1 Flora and Vegetation

The flora and vegetation field survey of the Matsu Deposit was undertaken from the 17th to the 18th of May 2012. Leading up to the survey period, January and February received below average rainfall, while March and April received slightly above average rainfall as evidenced by meteorological data from the Warmun weather station (Figure 3-1) which is situated 35 km from the Matsu Project area.

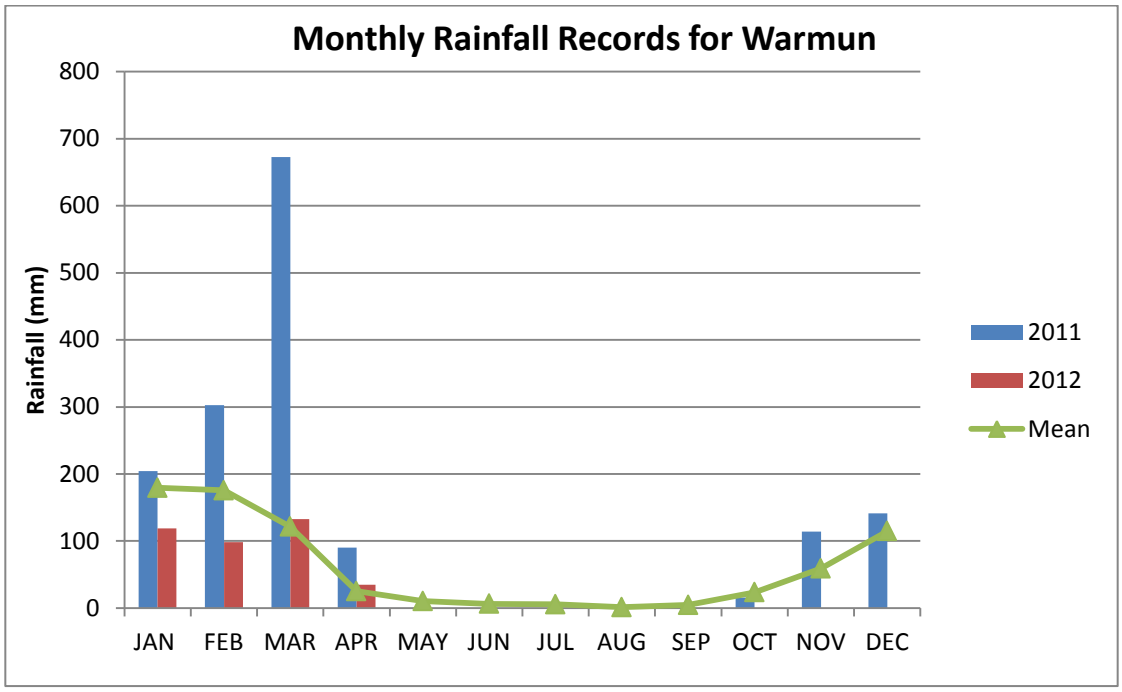

Figure 3-1: Monthly Rainfall Records from Warmun Weather Station (Australian Bureau of Meteorology 2012)

The Matsu Deposit field survey involved the verification of vegetation communities using aerial photography and direct observation from a helicopter. Where necessary, and practical, aerial observations were confirmed by ground survey work. The survey area covers parts of the M 259SA Lease which is situated immediately to the north of the Matsu Deposit (Figure 1-2).

Vegetation was described and identified using methods based on the National Vegetation Information System (NVIS). The NVIS is a collaborative initiative between the Australian Commonwealth, State and Territory governments to enable the compilation of a nationally consistent vegetation dataset from data collected by the states and territories. The NVIS hierarchy is presented in Appendix 3.

In this report vegetation is described at its broadest level at hierarchical Level III (Broad Floristic Formation) defined as '*Dominant growth form, cover and height of the ecologically dominant stratum'* and at its most detailed level at Level V (Association Level) defined as *'Dominant growth form, height, cover and species (three species) of the three traditional strata (i.e. Upper, mid and ground)'.* Colour aerial photography was used to assist with the vegetation mapping.

Threatened flora, Declared Rare and Priority flora and TEC's were searched for on foot. All Identification of plant species was carried in the field, no specimens were collected.

3.4.2 Fauna

In May 2012 a bird, bat and targeted Northern Quoll survey of the Matsu Deposit was conducted. Access was limited as there are no serviceable access tracks to the Matsu Deposit. All work was conducted within walking distance of small open areas along the ridgeline on which the helicopter could land.

Bird surveys were conducted from 17th May – 20st May 2012. Intensive opportunistic sampling was considered to be the most appropriate method to reveal the presence of *EPBC Act* listed bird species and also the most appropriate method to increase the general species count and obtain a reasonable assessment of the total species richness of the relatively small area able to be surveyed. Opportunistic sampling commenced at 0600 and proceeded throughout the day until 1600. As the surveys were opportunistic, and limited by helicopter access, it was difficult to approximate the area and locations covered. As a general rule, ornithologists rarely move more than 1 – 1.5 km in a one hour census, and remain within a particular habitat type for the duration of the census. A total of 50 hours were spent conducting opportunistic surveys.

A targeted survey for the Northern Quoll was undertaken over five nights in the Matsu Deposit, from 16th May till 21st May. Two areas with suitable habitat were targeted for trapping; one on the north side of the range and one on the south side. Up to 114 large box traps were deployed along the rocky ridge and sandstone boulder outcrops. This resulted in a total of 467 trap nights. Traps were baited with a moist mixture of rolled oats, peanut butter and sardines and checked daily within three hours of sunrise.

An echolocation survey was conducted to establish the presence of bats in the Matsu Deposit. The survey was conducted over four nights between the 17th May and the 21st May 2012. Two SM2BAT detectors (Wildlife Acoustics, USA) were placed on a cliff top site above a cave entrance where bat presence was expected. The jumper and audio settings used for the SM2BAT followed the manufacturer's recommendations for bat detection contained in the user manual (Wildlife Acoustics 2010). Selectable filters and triggers were also set using the manufacturer's recommendations. For all recordings, once reformatted as .wav files, COOL EDIT 2000 was used to display each "continuous call" sequence (EPA and DEC 2010) for identification. Only good quality call sequences were used.

Descriptions of fauna habitats were based on the vegetation associations, soils and landforms observed during the fauna field survey.

4 RESULTS

4.1 FLORA AND VEGETATION

4.1.1 Flora

A total of 137 taxa (species, subspecies and varieties) from 45 families and 96 genera were recorded in the course of the field survey of the Matsu Deposit (Appendix 4). Fabaceae (21 taxa) was the most specious genera, followed by Poaceae (14 taxa) and the Malvaceae and Myrtaceae (12 taxa) families.

4.1.2 Vegetation Communities

A total of 7 plant communities were observed during the course of the field survey of the Matsu Project area. The plant communities are described below and mapped in Figure 4-1. The communities may be further divided into subsets, largely driven by topographic effects within the landscape. While generally the plant communities and dominant species are shared between nearby iron ore deposits, each area also contains a subset of species not found on the other sites.

Vegetation Community: CCDC

CDCC: *Corymbia collina* and *Corymbia dichromophloia* with *Erythrophleum chlorostachys* open woodland over *Gardenia resinos*a subsp. *resinosa, Grevillea heliosperma* and *Petalostigma quadriloculare* over mixed open low woodland over *Triodia* aff. *bitextura* (*Cymbopogon ambiguus*) tussock grassland.

Occurrence: Ironstone formations, slopes with medium to gentle relief.

Associated species: *Eriachne ciliata*, *Eriachne* aff. *mucronata*, *Heteropogon contortus* and *Schizachirium fragile.*

Land System: Wickham

Plate A: *Vegetation Association* – CCDC

Vegetation Community: EB-s

EB-s: *Eucalyptus brevifolia*, *Eucalyptus confluens* (*Corymbia collina*) open woodland over *Erythrophleum chlorostachys* low woodland to low open woodland over *Petalostigma quadriloculare* and *Grevillea dryandri* subsp. *dryandri* open shrubland over *Acacia translucens* open heath over *Triodia bitextura*, *Schizachirium fragile* and *Cymbopogon ambiguus* tussock grassland.

Occurrence: Sandstone slopes.

Associated species: *Callitris columellaris* and *Erythroxylum ellipticum*

Land System: Wickham

Plate B: Vegetation Community – EB-s

Vegetation Community: EB-o

EB-o: *Eucalyptus brevifolia*, *Eucalyptus confluens* (*Corymbia collina*) open woodland over *Erythrophleum chlorostachys* low woodland to low open woodland over *Petalostigma quadriloculare* and *Grevillea dryandri* subsp. *dryandri* open shrubland over *Triodia bitextura*, *Schizachirium fragile* and *Cymbopogon ambiguus* tussock grassland.

Occurrence: Sandstone outcrops and ridge crests.

Associated species: *Acacia* aff. *asperulacea, Callitris columellaris, Comesperma secundum, Erythroxylum ellipticum* and *Mirbelia viminalis*

Land System: Wickham

Plate C: Vegetation Community EB-o

Vegetation Community: EB-w

EB-w: *Eucalyptus brevifolia, Eucalyptus confluens (Corymbia collina)* open woodland over *Erythrophleum chlorostachys* low woodland to low open woodland over *Petalostigma quadriloculare, Grevillea dryandri* subsp. *dryandri* open *shrubland* over *Triodia bitextura, Schizachirium fragile* and *Cymbopogon ambiguus* tussock grassland.

Occurrence: Woodlands on plains, valleys and gently undulating terrain.

Associated species: *Callitris columellaris* and *Erythroxylum ellipticum*

Land System: Wickham

Plate D: Vegetation Community – EB-w

Vegetation Community: EB-CCP

EB-CCP: *Corymbia cadophora* subsp. *polychroma* (P1) scattered trees over *Triodia* aff. *bitextura*, *Schizachirium fragile* and *Cymbopogon ambiguus* tussock grassland.
Occurrence: Sandstone outcrops and ridge crests.
Associated species: Not ground truthed
Land System: Wickham
(No Image available)

Vegetation Community: CL

CL: *Eucalyptus ordiana* (P2) scattered trees over *Triodia cremnophila* (P1) scattered tussock grass.
Occurrence: Steep slopes and precipitous rock faces. In areas of lower relief this vegetation community can form a mosaic with small patches of CDCC. This vegetation Community is representative of the Priority 1 PEC 'Plant assemblages on vertical sandstone surfaces' listed by DEC (Appendix 5).
Associated species: *Acacia lamprocarpa*, *Acacia multisiliqua*, *Acacia retivenea* subsp. *retivenea*, *Acacia thomsonii*, *Achyranthes aspera*, *Adansonia gregori*, *Atalaya salicifolia*, *Brachychiton viscidulus*, *Buchanania oblongifolia*, *Callitris columellaris*, **Calotropis procera*, *Calytrix extipulata* (shrub form), *Calytrix extipulata* (rock form), *Capparis lasiantha*, *Capparis umbonata*, *Celtis philippensis*, **Cenchrus americanus*, *Cheilanthes brownii*, *Christia australasica*, *Clerodendrum floribundum* var. *floribundum*, *Clerodendrum tomentosum* var. *tomentosum*, *Cochlospermum fraseri*, *Comesperma secundum*, *Corchorus sidoides*, *Corymbia aspera*, *Corymbia collina*, *Corymbia dichromophloia*, *Corymbia disjuncta*, *Cyanthillium cinereum*, *Cyperus cunninghamii* subsp. *uniflorus*, *Denhamia obscura*, *Dicliptera armata*, *Dodonaea hispidula* var. *arida*, *Dolichandrone heterophila*, *Eriachne ciliata*, *Erythrophleum chlorostachys*, *Eucalyptus ordiana* (P2), *Euphorbia schultzii*, *Evolvulus alsinoides* var. *decumbens*, *Ficus aculeata* var. *indecora*, *Ficus atricha*, *Ficus brachypoda*, *Flueggea virosa* subsp. *melanthesioides*, *Galactia tenuiflora*, *Gardenia resinosa* subsp. *resinosa*, *Gossypium australe*, *Grevilea refracta*, *Grevillea heliosperma*, *Grevillea velutinella*, *Heteropogon contortus*, *Hypoestes floribunda*, *Indigofera* sp. A Kimberley Flora, *Jacquemontia* sp. Keep River (P1), *Melhania oblongifolia*, *Oldenlandia kochiae*, *Opilia amentacea*, *Owenia vernicosa*, *Panicum decompositum*, **Passiflora foetida*, *Psydrax attenuata*, *Persoonia falcata*, *Petalostigma quadriloculare*, *Phyllanthus exilis*, *Phyllanthus grandisepala*, *Pittosporum spinescens*, *Polycarpaea involucrata*, *Santalum lanceolatum*, *Schizachyrium fragile*, *Scleria* aff. *brownii*, *Sida rohlenae*, *Sida* sp. A Kimberley Flora, *Solanum cunninghamii*, *Stemodia lythrifolia*, *Stenocarpus acacioides*, *Terminalia canescens*, *Terminalia ferdinandiana*, *Triodia cremnophila* (P1), *Triodia* sp. Argyle (currently nominated for priority status), *Triumfetta triandra*, *Triumfetta clivorum*, *Uraria lagopodioides*, *Wrightia saligna*, *Xenostegia tridentata*, *Yakirra australasica*, *Zornia muriculata*.
Land System: Wickham

Plate E: Vegetation Community – CL

Vegetation Community: VT

VT:	The composition of this vegetation association has not been fully assessed due to difficulties in accessing areas supporting this vegetation association. It is known to include *Celtis philipinensis.*
Occurrence:	Occasionally in pockets at the base of the cliffs but these have not been visited to determine their composition. This vegetation Community is representative of the Priority 1 PEC 'Monsoon Vine Thicket' listed by DEC in Appendix 5.
Associated species:	Not available as the areas representing this vegetation community were not ground truthed
Land System:	Wickham

RIDGES IRON ORE PROJECT
Vegetation Communities at the Matsu Development Footprint
Figure 4-1

1:11,000
23/04/2013

0 150 300 600
Metres

GDA 1994 MGA Zone 52

kmg kimberley metals group
aPM ANIMAL PLANT MINERAL
kaisan@animalplantmineral.com.au / (08) 6296 5155

428250 429000 429750 430500 431250

8154750 8154000 8153250 8152500

M 259SA
E 80/2389
P 80/1750
E 80/4303
M 259SA

EB-W
CL
CDCC
EB-O
EB-S
EB-CCP
VT

Legend

- Vegetation Mapping Extent
- Matsu Access Track
- Matsu Development Footprint
- Mining Tenements

Vegetation Communities

CDCC:Corymbia collina and Corymbia dichromophloia with Erythrophleum chlorostachys open woodland over Gardenia resinosa subsp. resinosa, Grevillea heliosperma and Petalostigma quadriloculare over mixed open low woodland over Triodia aff. bitextura (Cymbopogon:ambiguus) tussock grassland.

CL: Eucalyptus ordiana (P2) scattered trees over Triodia cremnophila (P1) scattered tussock

EB-CCP: Corymbia cadophora subsp. polychroma (P1) scattered trees over Triodia aff. bitextura, Schizachirium fragile and Cymbopogon ambiguus tussock grassland.

EB-O:Eucalyptus brevifolia, Eucalyptus confluens (Corymbia collina) open woodland over Erythrophleum chlorostachys low woodland to low open woodland over Petalostigma quadriloculare and Grevillea dryandri subsp. dryandri open shrubland over Triodia cf. bitext

EB-S:Eucalyptus brevifolia, Eucalyptus confluens (Corymbia collina) open woodland over Erythrophleum chlorostachys low woodland to low open woodland over Petalostigma quadriloculare and Grevillea dryandri subsp. dryandri open shrubland over Acacia translucens:open heath over Triodia cf, bitextura, Schizachirium fragile and Cymbopogon ambiguus tussock grassland.

EB-W:Eucalyptus brevifolia, Eucalyptus confluens (Corymbia collina) open woodland over Erythrophleum chlorostachys low woodland to low open woodland over Petalostigma quadriloculare, Grevillea dryandri subsp. dryandri open shrubland over Triodia cf. bitextura

VT: The composition of this vegetation association has not been fully assessed due to difficulties in accessing areas supporting this vegetation association. It is Known to include Celtis.

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4.1.3 Vegetation Condition

In accordance with the Keighery (1994) vegetation condition scale, all ground survey sites observed in this survey were classified as 'excellent'. 'Excellent' is defined by Keighery as: *Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.* The full vegetation condition scale is provided in Appendix 6.

4.1.4 Introduced Flora

The Protected Matters search tool did not return any botanical or geographical MNES or Other Matters protected by the *EPBC Act*. However, four invasive plant taxa listed as MNES were identified as being likely to occur in the vicinity of the Project area. These were **Cryptostegia grandiflora*,**Cenchrus ciliaris*, **Parkinsonia aculeata* and **Urochloa mutica* (formerly *Brachiaria mutica*). The Protected Matters Search Tool report itemising the results is provided in Appendix 2.

Of the 137 taxa recorded in the Matsu Deposit, four were introduced (weed) species (Table 4-1). Images of the weed species are provided in Appendix 7 and their locations are mapped in Figure 4-2.

**Calotropis procera* and **Passiflora foetida* are classified as 'invasive' under the Invasive Plant Prioritisation Process (DEC 2012b) with medium and high ecological impact respectively.

Table 4-1: Introduced Species Recorded in the Matsu Project area

Species	Common Name	Family	Sites Recorded	Habitats Recorded	Vegetation Associations	Location (WGS84/52K)	
						Easting	Northing
**Calotropis procera*	Calotrope / Rubber bush	Apocynaceae	Opportunistic Recording	Cliff faces and cliff margins	CI	429547	8153153
**Cenchrus americanus*	Pearl Millet	Poaceae	Relevé and Opportunistic Recordings	Ironstone slopes, ridges and gullies	CI	430758	8152924
**Melinis repens*	Natal Red Top	Poaceae	Opportunistic Recording	Sandy areas, cliffs	CDCC	429547 430638	8153153 8152955
**Passiflora foetida*	Stinking Passion Flower	Passifloraceae	Opportunistic Recording	Cliff faces and Cliff Margins	CI	430758	8152924

4.1.5 Flora and Vegetation of Conservation Significance

The Protected Matters search tool did not return any botanical or geographical MNES or Other Matters protected by the *EPBC Act*. The Protected Matters Search Tool report itemising the results is provided in Appendix 2.

The Native Vegetation Map Viewer search revealed that the Project area does not include any lands considered as Environmentally Sensitive areas under Section 51B of the *EP Act.*

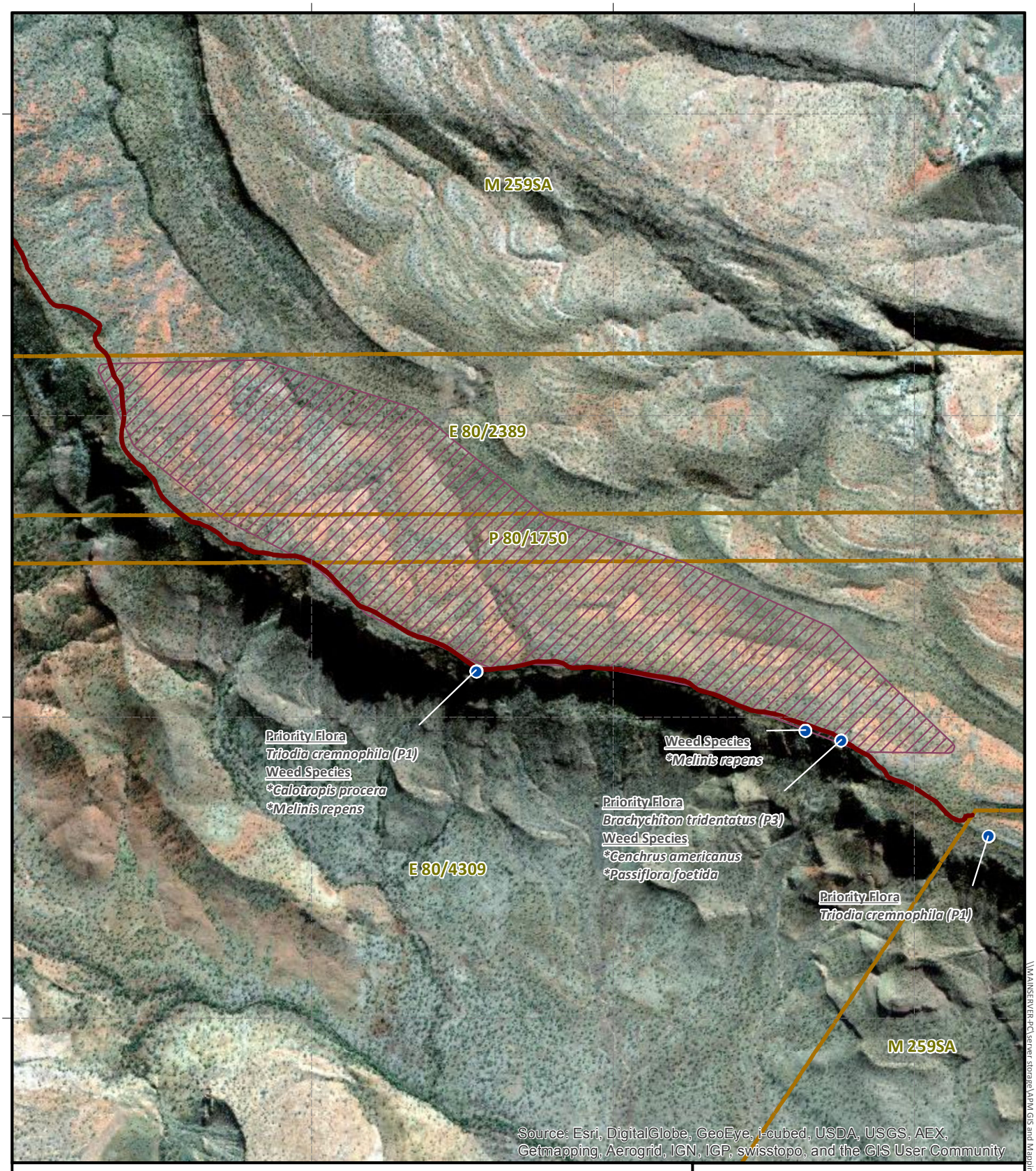
Database searches undertaken by DEC did not detect any PEC's or TEC's within the Project area. The DEC's Threatened (Declared Rare) and Priority Flora Database, Threatened and Priority Flora List and the WA Herbarium Specimen Database found a number of priority species that could potentially occur within the Project area (Table 4-2).

Table 4-2: Declared Rare and Priority Flora Potentially Occurring in the Matsu Project area

Species	Conservation Code	DEC Database Search of Potentially Occurring Species			Habitat
		Threatened (Declared Rare) Flora Database	Threatened & Priority Flora List	WA Herbarium Specimen Database	
Acacia repens	P1			√	-
Acacia setulifera	P1	√		√	-
Acacia sp. Cockburn Range (R. Pullen 10. 763)	P3		√		Erosion surface of plain above river, rock outcrops, shrub grassland.
Asteromyrtus arnhemica	P1			√	Banks of seasonal streams, near waterfalls, along tracks in wet areas.
Bonamia oblongifolia	P1			√	-
Brachychiton tuberculatus	P3		√		Undulating plains.
Corymbia cadophora subsp. polychroma	P1	√		√	Gentle sandstone slopes.
Cyperus digitatus	P1		√		Waters' edge.
Desmodium flagellare	P1		√		-
Dolichandrone filiformis	P2		√		-
Echinochloa kimberleyensis	P1		√		Swamps.
Eucalyptus costuligera	P1		√		-
Eucalyptus ordiana	P2	√		√	Steep rocky outcrops.
Ficus lilliputiana	P4		√		Rocky sites.
Fuirena incrassata	P3	√		√	Swamps, creek beds, claypans, semi-saline lakes.
Goodenia byrnesii	P1	√		√	Edge of creek.
Goodenia durackiana	P1		√		Grassland.
Goodenia malvina	P1		√		Seasonally wet areas.
Goodenia sepalosa var. glandulosa	P3		√		-
Grevillea minuata	P4			√	Cliffs or rocky slopes, sometimes along watercourses.
Heliotropium cupressinum	P1		√		Stony sandy soils, sandstone.
Heliotropium foveolatum	P1		√		-
Heliotropium uniflorum	P1		√	√	Stony slopes, undulating rocky plateaus.
Ipomoea gracilis	P1		√		Black cracking clay or black

Species	Conservation Code	DEC Database Search of Potentially Occurring Species			Habitat
		Threatened (Declared Rare) Flora Database	Threatened & Priority Flora List	WA Herbarium Specimen Database	
					sand. Irrigated areas.
Jacquemontia sp. Keep River (J.L. Egan 5051)	P1		√	√	-
Olearia arguta var. glabrous narrow leaves	P3		√		-
Macrothelypteris torresiana	P1		√		Wet rock face of gorge.
Melaleuca viminalis	P2			√	-
Phyllanthus aridus	P3	√	√		-
Selaginella pygmaea	P2		√		Damp ground near creek.
Sorghum plumosum var. teretifolium	P1		√		Sand, clay, loam, alluvium. Swamps, claypans, watercourses, waterholes, valleys.
Triodia barbata	P1		√		Cliffs.
Triodia bunglensis	P2			√	Cliffs, gorges & domes, often in fissures & cracks.
Triodia cremnophila	P1			√	-
Triodia fitzgeraldii	P1		√		Sandstone hills.
Triodia fissura	P1			√	Growing in narrow fissures on steep or near vertical rock faces
Triodia pasconieana	P1		√		Limestone. Limestone ranges & gorges.
Triodia prona	P1			√	Lower slopes of sandstone mountain range.
Triodia racemigera	P1		√	√	Steep rocky slopes, crevices, cliffs & ridges.
Triodia triticoides	P1		√		Rocky sandstone & limestone hillslopes.

No Threatened Flora pursuant to the *WC Act*, were recorded during the ground survey work in the Matsu Deposit, however, eight priority taxa as defined by the DEC were recorded (Table 4-3), images are provided in Appendix 8. Flora and vegetation of conservation significance are mapped in Figure 4-2.



Legend

- Matsu Access Track
- Matsu Development Footprint
- Mining Tenements

Priority Flora

- *Brachychiton tridentatus*(P3)
- *Triodia cremnophila*(P1)

Weed Species

- **Calotropis procera*
- **Cenchrus americanus*
- **Melinis repens*
- **Passiflora foetida*

RIDGES IRON ORE PROJECT

Priority Flora and Weed Species at the Matsu Development Footprint

Figure 4-2

1:17,500
8/05/2013

0 400 800
Metres

GDA 1994 MGA Zone 52

kmg kimberley metals group
aPM animal plant mineral
kaisan@animalplantmineral.com.au / (08) 6296 5155

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Currently *Triodia cremnophila* is only known to occur in WA along cliffs that are located along the southern reaches of the Rugged Range. *Triodia cremnophila* is a dominant species of the PEC 'Plant assemblages on vertical sandstone surfaces

Kunzea sp. Keep River is a significant discovery for the region as it was previously only known from the NT and thus represents a new taxon to WA. *Kunzea* sp. Keep River also represents a significant range extension for this genus, with the nearest record for *Kunzea recurva* located near the Murchison River, 1868 km to the south west (FloraBase 2012). A regional survey was carried out for *Kunzea* sp. Keep River in July 2012 (APM 2013); the locations of those recorded are presented in Figure 4-3.

Triodia sp. Argyle (aff. cunninghamii), is currently under review for priority status and taxonomic description (R. Barrett. pers. comm. 2012).

The seven vegetation communities described in Section 4.1.1 do not resemble any of the TEC's listed under the Commonwealth *EPBC Act.* However two communities are representative of PEC's listed by the DEC (Appendix 5). The vegetation community associated with cliff surfaces (CL) was identified as the Priority 1 PEC 'Plant assemblages on vertical sandstone surfaces' and pockets of vegetation on steep south facing slopes to the south of the Matsu Project area were identified from the air as the Priority 1 PEC –'Monsoon Vine Thicket' (VT). Both priority communities are mapped in Figure 4-1.

The PEC's will not be impacted by the development of Matsu. The vertical sandstone surfaces will remain undisturbed as mining operations will be restricted to the back slopes and a buffer will be implemented between the edge of the escarpment and the mining area, therefore protecting the cliff faces and associated vegetation from impact. The Monsoon Vine Thicket pockets are located outside of the impact footprint.

Table 4-3: Priority taxa recorded within the Matsu Project area.
***Species known to occur within described vegetation types but not recorded due to limited access.**

Priority Code	Species	Habitat	Location (WGS84/52K)
P3	*Brachychiton tridentatus*	Sand, sandstone. Rocky hills & ridges	E: 430758, N: 8152924
P1	*Corymbia cadophora* subsp. *polychroma*	Sandstone, banded ironstone gentle slopes. Damp land, creeklines.	*Occurs throughout the EB-CPP vegetation community.
P2	*Eucalyptus ordiana*	Steep rocky outcrops. Cliff faces and cliff margins of ironstone/sandstone geological formations	*Occurs in association with the CL cliff vegetation community.
P4	*Grevillia minuata*	Cliffs or rocky slopes, sometimes along watercourses.	*Forms scattered thickets throughout the EB-w vegetation community
P1	*Jacquemontia sp. Keep River (J.L. Egan 5051)*	Cliff faces and cliff margins of ironstone/sandstone geological formations	*Probably occurs throughout the CL vegetation community
Currently nominated for priority status	*Kunzea* sp. Keep River	Damp shaded sand stone cliff faces.	C.379 individuals on south west facing cliffs. E: 428933, N: 8153498 E: 428750, N: 8153392
P1	*Triodia cremnophila*	Cliff faces and cliff margins of ironstone/sandstone geological formations.	E: 429547, N: 8153153 E: 431247, N: 8152605

Priority Code	Species	Habitat	Location (WGS84/52K)
		Drainage lines	
Currently nominated for priority status	*Triodia* sp. Argyle (aff. cunninghamii)	Cliff faces and cliff margins of ironstone/sandstone geological formations	Probably occurs throughout the CL vegetation community

Legend

- *Kunzea* Populations
- *Kunzea* Collection Point
- Matsu Access Track
- Matsu Development Footprint

RIDGES IRON ORE PROJECT

Kunzea near the Matsu Development Footprint

Figure 4-3

Scale: 1:22,500

Date: 10/04/2013

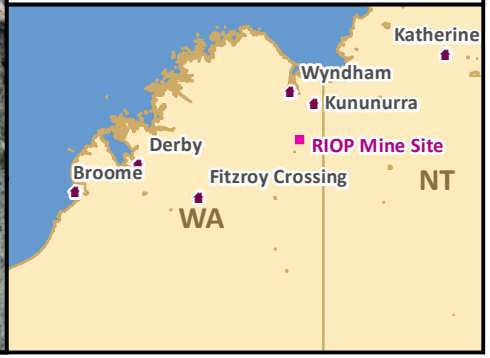
Author: K. Critchell

0 320 640 1,280

Metres

GDA 1994 MGA Zone 52

kmg kimberley metals group
animal plant mineral
kaisan@animalplantmineral.com.au
(08) 6296 5155



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4.2 FAUNA SURVEY RESULTS

4.2.1 Survey Adequacy

General database searches indicate that 222 bird species, 84 reptile species, 26 amphibian species and 39 mammal species have been located in the area. Recent studies in the local area undertaken on the RIOP and Argyle Diamond Mine have recorded 99.1 % of the expected birds, 95.2 % of the expected reptiles, 80.8 % of the expected amphibians and 94.9 % of the expected mammals for the area (Table 4-4). Based on the quality of the data in surrounding areas we have almost complete certainty of the species assemblages of the area and can accurately describe the species assemblages of the Matsu Deposit area based on a desktop assessment.

Table 4-4: Survey Adequacy across the Local RIOP Area

	Expected	RIOP area	Argyle and RIOP combined
Birds	222	36.0%	99.1%
Reptiles	84	48.8%	95.2%
Amphibians	26	42.3%	80.8%
Mammals	39	69.2%	94.9%

4.2.2 Fauna of Conservation Significance

Based on searches of the *EPBC Act*, DEC list of Threatened and Priority Fauna and NatureMap approximately 28 species of conservation significance have previously been recorded or have the potential to occur within 20km of the Project. These species comprise 20 birds, three mammals, two reptiles, one invertebrate and two fish, and are shown in Table 4-4.

Of these 28 species, data from adjacent baseline surveys reveals that very few of these species are expected to occur. Those species that are likely to occur, based on habitat known to occur in the Project area, are shaded in blue in Table 4-4.

Table 4-5: List of Conservation Significant Fauna potentially occurring in the Matsu Project area

Species	Common Name	Conservation Status			Likelihood of Occurrence in the Matsu Project Area and the Proposed Access Track
		Commonwealth Level (*EPBC Act*)	State Level (*WC Act*)	DEC (Priority status)	
Birds					
Anseranas semipalmata	Magpie Goose	Listed Marine Species			**Unlikely to Occur.** While this species does utilise aquatic and terrestrial habitats, it is mainly found in shallow wetlands with dense growth of rushes or sedges (SEWPaC SPRAT 2013). No suitable habitat occurs in the Matsu Project area.
Tadorna radjah	Burdekin Duck		Schedule 4		**Highly Unlikely to Occur**. The species prefers the brackish waters of mangrove flats and paperbark tree swamps, but will visit freshwater swamps, lagoons, and billabongs further inland during the wet season. It has been recorded at the sewage ponds of the Argyle Diamond Mine. No suitable habitat occurs in the Matsu Project area.
Phaps histrionica	Flock Bronzewing			Priority 4	**Unlikely to Occur**. This species is the most nomadic of the Australian pigeons and is occasionally found in the Kimberley. Its preferred habitat is open grassland on black soil plains, salt bush and *Triodia* hummock grasslands. It has been recorded in the Lake Argyle area.
Apus pacificus	Fork-tailed Swift	Migratory Marine/ Wetland Species			**Highly Likely to Occur.** This species is almost exclusively aerial. It occurs over cliffs, beaches, islands and settled areas (SEWPaC SPRAT 2013). This is a seasonal migrant and has been recorded in previous wet season surveys in the area.
Ardea ibis	Cattle Egret	Migratory Marine/ Wetland Species			**Unlikely to Occur.** While this species often forages away from water on low lying grasslands and improved pastures, it is mainly associated with shallow, open and freshwater wetlands (SEWPaC SPRAT 2013). No suitable habitat occurs in the Matsu Project area.

Species	Common Name	Conservation Status			Likelihood of Occurrence in the Matsu Project Area and the Proposed Access Track
		Commonwealth Level (*EPBC Act*)	State Level (*WC Act*)	DEC (Priority status)	
Ardea alba	Great Egret, White Egret	Migratory Marine/ Wetland Species			**Unlikely to Occur.** This species usually frequents shallow waters of a wide range of wetlands (SEWPaC SPRAT 2013) of which there are none in the Matsu Project area.
Ixobrychus minutus	Little Bittern			Priority 4	**Highly Unlikely to Occur**. This species is associated with wetlands fringed with dense vegetation. No suitable habitat occurs in the Matsu Project area.
Ixobrychus flavicollis	Black Bittern			Priority 3	**Highly Unlikely to Occur**. This species is associated with wetlands fringed with dense vegetation. No suitable habitat occurs in the Matsu Project area.
Botaurus poiciloptilus	Australasian Bittern		Schedule 1 Endangered		**Highly Unlikely to Occur**. This species occurs mainly in densely vegetated freshwater wetlands (SEWPaC SPRAT 2013), which do not occur in the Matsu Project area.
Haliaeetus leucogaster	White-bellied Sea-eagle	Migratory Terrestrial/ Marine Species			**Unlikely to Occur**. Found in both coastal and terrestrial habitats such as estuaries, mangroves, woodlands, rivers and lakes. Generally forages over large expanses of water (SEWPaC SPRAT 2013) which do not occur in the Matsu Project area.
Falco peregrinus	Peregrine Falcon		Schedule 4		**Likely to Occur**. While this species is found across Australia, it is not common anywhere. It uses a wide range of habitats and is associated with cliffs where it nests. There are suitable cliffs in the Matsu Project area and it has been recorded at nearby Argyle Diamond Mine and north in the RIOP.

Species	Common Name	Conservation Status			Likelihood of Occurrence in the Matsu Project Area and the Proposed Access Track
		Commonwealth Level (*EPBC Act*)	State Level (*WC Act*)	DEC (Priority status)	
Ardeotis australis	Australian Bustard			Priority 4	**Unlikely to Occur.** While **t**his species has been recorded at the nearby Argyle Diamond mine, it has not been recorded in previous surveys on the rocky ridges as represented in the Matsu Project area; it prefers the flat plains.
Burhinus grallarius	Bush Stone-curlew			Priority 4	**Unlikely to Occur**. While **t**his species has been recorded at the nearby Argyle Diamond mine, it has not been recorded in previous surveys on the rocky ridges as represented in the Matsu Project area; it prefers the flat plains.
Charadrius veredus	Oriental Plover, Oriental Dotterel	Migratory Wetland/ Marine Species			**Unlikely to Occur**. This species is a non-breeding visitor to Australia (breeds in Mongolia). Upon arrival, they utilise the coastal habitats such as estuarine mudflats and sandbanks. They then move inland where the preferred habitat is flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps (SEWPaC SPRAT 2013).
Rostratula australis	Australian Painted Snipe	Vulnerable	Schedule 1 Endangered		**Highly Unlikely to Occur**. This species is extremely cryptic and can often be found sheltering in dense grass or under the shade of trees well away from water. However, typical habitat comprises ephemeral or permanent water, usually with muddy edges (SEWPaC SPRAT 2013). No suitable habitat occurs in the Matsu Project area.
Glareola maldivarum	Oriental Pratincole	Migratory Wetland/ Marine Species			**Unlikely to Occur**. This species is a non-breeding visitor which hawks low over flooded grassland or on the ground where locusts are present (SEWPaC SPRAT 2013). No suitable habitat occurs in the Matsu Project area.
Merops ornatus	Rainbow Bee-eater	Migratory Terrestrial/ Marine Species			**Highly Likely to Occur**. This species usually occurs in open, cleared or lightly timbered areas that are often, but not always, located in close proximity to permanent water (SEWPaC SPRAT 2013). It has been recorded in the Matsu Project area.

Species	Common Name	Conservation Status			Likelihood of Occurrence in the Matsu Project Area and the Proposed Access Track
		Commonwealth Level (*EPBC Act*)	State Level (*WC Act*)	DEC (Priority status)	
Malurus coronatus	Purple-crowned Fairy-wren	Vulnerable		Priority 4	**Unlikely to Occur**. This species prefers to occupy habitats along or very close to rivers and streams, in thick vines or pandanus but occurs less frequently in dense grasslands and mangroves (SEWPaC SPRAT 2013). No suitable habitat occurs in the Matsu Project area.
Erythrura gouldiae	Gouldian Finch	Endangered/ Migratory Terrestrial		Priority 4	**Highly Likely to Occur**. This species has been recorded nearby in previous surveys and was also recorded at the RIOP camp during the current survey. It is expected to occur in the Matsu Project area at various times of the year related to the seeding of food grass species.
Heteromunia pectoralis	Pictorella Mannikin			Priority 4	**Highly Likely to Occur**. This species was recorded at the RIOP camp during a recent survey. It is expected to occur in the Matsu Project area at various times of the year related to the seeding of food grass species.
Mammals					
Dasyurus hallucatus	Northern Quoll	Endangered	Schedule 1 Endangered		**Unlikely to Occur**. A targeted search of the Matsu Project area and the neighbouring ridges of RIOP (from previous surveys) did not find any Northern Quolls. No quolls were recorded in surveys on the nearby Argyle Diamond Mine.
Hydromys chrysogaster	Water-rat			Priority 4	**Unlikely to Occur**. This species prefers permanent water bodies of brackish and fresh water. They live in burrows in the bank along the water (Australian Museum 2010a). Ideal habitat does not occur in the Matsu Project area.
Leggadina lakedownensis	Short-tailed Mouse			Priority 4	**Unlikely to Occur**. This species is known to occur on sandy soils and cracking clays in Western Australia (DEC 2012d). Ideal habitat does not occur in the Matsu Project area.
**Rhinonicteris auriantia*	*Orange Leaf-nosed Bat		Schedule 1-Vulnerable		**Highly Likely to Occur**. These bats prefer very humid caves. The species is known to expand to woodlands during the wet season and contract back to the caves in the dry season. This species was recorded inside the Matsu Project area, the RIOP Mine Site area as well as 15 km north of the RIOP Mine Site.

Species	Common Name	Conservation Status			Likelihood of Occurrence in the Matsu Project Area and the Proposed Access Track
		Commonwealth Level (*EPBC Act*)	State Level (*WC Act*)	DEC (Priority status)	
**Hipposideros stenotis*	*Northern Leaf-nosed Bat			Priority 2	**Highly Likely to Occur**. These bats prefer low humidity caves preferring to roost singly or in small groups close to the entrance. Experience from other locations have shown that these bats remain present in areas that have mid to high levels of human activity (Bullen unpublished) even to the extent that *H. stenotis* has remained present during and after large scale open cut mining on Koolan Island. This species has been recorded inside the RIOP as well as 15 km north. It was not recorded during this survey.
**Macroderma gigas*	*Ghost Bat			Priority 4	**Highly Likely to Occur**. This species expands its foraging range in the wet season and contracts back to stable roost caves during the dry season. This species was recorded inside the Matsu Project area and in the RIOP Mine Site area.
Reptiles					
Crocodylus johnstoni	Freshwater Crocodile	Listed Marine Species		Schedule 4	**Highly Unlikely to Occur**. This species inhabits various freshwater environments and will move through the inundated floodplains during the wet season (Australian Museum 2010b). No suitable habitat occurs in the Matsu Project area.
Crocodylus porosus	Salt-water Crocodile	Migratory Marine Species			**Highly Unlikely to Occur**. This species mostly occurs in tidal rivers, coastal floodplains and channels, billabongs and swamps up to 150 km inland from the coast. This habitat does not occur in the Matsu Project area (SEWPaC SPRAT 2013).
Invertebrates					
Mouldingia orientalis	Land snail			Schedule 1	**Possible Occurrence.** These snails are often associated with, and restricted to, the tropical vine thickets in the Kimberley. The sandstone cliff maintains a vegetation community representative of tropical vine thicket and so this species has the potential to occur in the Matsu Project area. However no impacts are expected as the sandstone cliffs and vine thickets will not be disturbed by Matsu operations.
Fish					

Species	Common Name	Conservation Status			Likelihood of Occurrence in the Matsu Project Area and the Proposed Access Track
		Commonwealth Level (*EPBC Act*)	State Level (*WC Act*)	DEC (Priority status)	
Pristis microdon	Freshwater Sawfish	Vulnerable			**Highly Unlikely to Occur**. There are no rivers present in the Matsu Project area suitable for either permanent residence or migration of these fish.
Syncomistes rastellus	Drysdale Grunter			Priority 2	**Highly Unlikely to Occur**. This species prefers large streams rather than small tributaries (Fishbase 2013) of which there are none in the Matsu Project area.

* These bat species were not listed on any government database as potentially occurring in the area, however, over the course of three surveys (APM 2009, 2010 and 2012); these bat species of conservation significance have been recorded.

4.2.3 Fauna Habitats

The types of fauna habitats occurring within the Matsu Project area are summarised below:

Rocky Outcrops

On the lightly wooded stony slopes, that have an established shrub layer and a ground cover of hummock grasses the Kimberley Rock-rat *Zyzomys woodwardi*, Storr's Monitor *Varanus storri* subsp. *ocreatus* and the more woodland orientated skinks such as *Ctenotus inornatus* have been captured in abundance at nearby surveys.

Surface expressions of sandstone boulders are a common occurrence and provide complex refuges for saxacoline reptile species, including the Panther Skink *Ctenotus pantherinus*, and small mammals, such as the Stripe-faced Dunnart *Sminthopsis macroura*.

The rockier habitats (outcroppings) support a more unique fauna assemblage including the Spiny-tailed Monitor, *Varanus acanthurus* and the Spotted Gecko *Gehyra punctata*. The *Triodia* spp. is particularly favoured by the skink, *Ctenotus pantherinus* and the Spinifex specialist *Strophurus taeniatus*. The Long-tailed Rock Monitor *Varanus kingorum* would also occur and is known to be a rock specialist.

During trapping the Common Rock-rat *Zyzomys argurus* (75 individuals) and the Ningbing False Antechinus *Pseudantechinus ningbing* (two individuals) were captured in this habitat.

Plate F: Rocky Outcrops

Open Eucalyptus/Corymbia Woodland with mixed Tussock Grasses on Rocky Ridges

This is the most common habitat covering much of the Project area and representing an interzone between multiple habitats, including nearby rocky outcrops, cliffs or drainage lines.

Widely foraging species such the Greater Black Whips Snake *Demansia papuensis*, Black-headed Python *Aspidites melanocephalus* and the Spotted Snake *Suta punctata* would utilize this habitat and be well represented in the project area. The diverse woodland species and mid-dense grass layer create a good cover for the swift moving Ctenotus species, such as *C. inornatus* and *C. robustus*, and the pygopid *Pygopus steelescotti*. The interspersed shrubland provides habitat for dragons, such as *Diporiphora lalliae* and *D. magna*, and the gecko *Strophurus ciliaris* that perches on shrub branches, relying on crypsis to escape predation during the day. Fossorial skink species are abundant in the dense litter and detrital layer, including the Rainbow Skink *Carlia triacantha* and the small legless lizard *Lerista borealis*.

No amphibians are expected to occur in this habitat other than water holding species such as *Cyclorana* spp. which burrow deep within clay soils and emerging in the wet season. Bird species which favour the open woodland include the Weebil *Smicrornis brevirostris*, Brown Honeyeater *Lichmera indistincta* and Northern Rosella *Platycercus venustus*.

Small mammals may include the Long-tailed Planigale Planigale ingrami, whilst Wild dogs, *Canis familiaris*, the Antilopine Wallaroo *Macropus antilopinus* and the Euro *Macropus robustus* would best represent the macro-fauna of the Project area.

Plate G: Open Eucalyptus/Corymbia Woodland with mixed Tussock Grasses on Rocky Ridges

Gullies and Creeklines

Minor, intermittent ephemeral drainage within the Matsu project area consists of a small creek at the bottom of the slope and several gullies leading into it from the top of the escarpment. The base of many of these small gullies and creeklines sustain numerous small pools. Although mostly ephemeral, when present these pools provide an important water source for many species, notably numerous species of frog (including the invasive Cane Toad). In addition to the pools, the low-lying areas support a different suite of vegetation, being slightly denser than that of the surrounding woodland.

A number of smaller mammals utilize the intermittent drainage lines where deposition of silt and sand promote the growth of very thick hummock and tussock grasses. In identical habitats, a number of Long-tailed Planigale *Planigale ingrami*, Chestnut Mice *Pseudomys nanus* and Long-haired Rats *Rattus villosisimus* have been recorded in previous surveys. Kimberley Rock-rats *Zyzomys argurus* from adjacent steep rocky slopes will also utilise the habitat.

The greatest bat species richness is typically recorded around wet areas, particularly where the water occurs in close association to rock outcrops and overhangs. Species expected include the Gould's Wattled Bat *Chalinolobus gouldii*, the Beccari's Freetail Bat *Mormopterus beccarii*, the Hoary Wattled Bat *Chalinolobus nigrogriseus*, the bent-wing bat *Miniopterus schreibersii*, the Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*, the Little Broad-nosed Bat *Scotorepens greyii* and the Northern Cave Bat *Vespadelus caurinus*.

Plate H: Gullies and Creeklines

Sandstone Cliffs

The sandstone cliffs in the area are quite extensive, bordering much of the western and south western sides of the Matsu deposit and Access Track. Species likely to favour these environments are cliff dwelling reptiles such as *Varanus glauerti*, rock wallabies, bird species such as the White-quilled Rock-pigeon *Petrophassa albipennis* and bats such as the Northern Leafnosed-bat *Hipposideros stenotis*. If present the Peregrine Falcon *Falco peregrinus* will also nest on these vertical cliffs. The sandstone cliffs will not be impacted by activities at Matsu as mining operations will be restricted to the back slopes and a buffer zone will be implemented to further protect the cliff faces.

Plate I: Sandstone Cliffs

4.2.4 General Fauna

As described in Section 4.2.3, the Matsu Project area only contains four distinct fauna habitats. Based on known distributions and habitat preferences, the expected fauna list for the Matsu Project area comprises 118 bird, 34 mammal, 74 reptile and 18 amphibian species (Appendix 9).

Birds

A total of 44 bird species were recorded during the current survey (Appendix 10). The Rainbow Bee-eater *Merops ornatus* was the only species of conservation significance to be recorded. Two bird species, Tree Martin *Petrochelidon nigricans* and Masked Woodswallow *Artamus personatus*, were observed within the RIOP area for the first time during this survey. The Tree Martins were observed feeding along the cliff face; while a group of 50+ Masked Woodswallows was seen flying over the Matsu Project area migrating in a north-easterly direction.

Mammals

While no Northern Quoll were recorded during the trapping survey, two other mammals were trapped; the Common Rock-rat *Zyzomys argurus* (75 individuals) and the Ningbing False Antechinus *Pseudantechinus ningbing* (two individuals). The trapping of the Ningbing False Antechinus is the first record for the RIOP area and neighbouring Argyle Diamond Mine. Additionally, two species were observed opportunistically during the bird surveys; the Euro *Macropus robustus* and Short-eared Rock-wallaby *Petrogale brachyotis*.

The echolocation survey revealed the presence of ten bat species in the Matsu Project area (Appendix 10). Two of these species are of conservation significance; the Ghost Bat *Macroderma gigas* (Priority 4) and Orange Leafnosed-bat *Rhinonicteris aurantia* (Vulnerable under the *WC Act*). Both are species that roost in caves and as the bat-detectors were positioned above two cave entrances, it is reasonable to assume these species utilize the caves in the cliff face of the Matsu Project area for roosting. Previous surveys have also recorded the Northern Leafnosed-bat *Hipposideros stenotis* (Priority 2) in the RIOP area. This species utilizes similar habitat to the Orange Leafnosed-bat and as such has the potential to occur in the Matsu Project area.

Reptiles

Based on literature and previous surveys of the region a total of 74 reptiles have the potential to occur in the Matsu Project area. While the current survey did not include a reptile component two species were observed opportunistically while conducting bird surveys. These were the Spiny-tailed Monitor *Varanus acanthurus* and Green Tree Snake *Dendrelaphis punctulata*. No species of conservation significance are expected to occur in the Matsu Project area.

Amphibians

The current survey opportunistically recorded two of the potential 18 amphibian species in the Matsu Project area, the Rockhole Frog *Litoria meiriana* and the introduced Cane Toad *Rhinella marina*. The creek at the bottom of the slope of the Matsu Project area contained high numbers of Cane Toads at various stages of development. The Cane Toad is an invasive poisonous species that has caused the population decline of many native predators; its progress through Australia has been documented and it was recorded entering WA in March 2009. No Cane Toads were observed during the August 2010 survey of the RIOP area. However, at the Argyle Diamond Mine the first Cane Toads were recorded in 2011 and it appears that Cane Toads reached the RIOP area sometime between 2010 and 2012 and are now firmly established in the area. Other than the Cane Toad, which is listed as invasive in the *EPBC Act*, no species of conservation significance are expected to occur in the Matsu Project area.

5 DISCUSSION AND CONCLUSION

5.1 FLORA AND VEGETATION

The upper strata (canopy layer) of the vegetation communities occurring within the Matsu Project Area are relatively uniform and represent *Eucalyptus/Corymbia* woodland and open woodland, typical of the sandstone and ironstone ridges and plateaus found throughout the Rugged Range (APM 2010, APM 2009, Ecologia 2005).

Of the vegetation communities observed during ground truthing, a higher degree of heterogeneity was found throughout the mid and ground stratum (shrub/grass and herb layer). These two strata can often form sub communities which are too small to map at a practical scale. This is particularly relevant to vegetation community EB-w, which contains thickets of *Grevillea minuata*, a Priority 4 shrub species. To accurately determine the potential for direct impact from the Matsu Project on stands of this species further comprehensive ground survey work would be required.

However *Grevillea minuata* has previously been recorded throughout the Sam, North of Sam and Tony iron ore deposits of the RIOP to the north (Ecologia 2005) and throughout the southern reaches of the Ragged Range. Therefore it could be said the species is relatively well represented in the local area and the areas proposed for disturbance comprise a small portion of its potential distribution.

The vegetation community CL runs virtually unbroken along the western and south western edges of the Matsu Project area and is representative of a Priority 1 PEC. The CL community is associated with three Priority taxa *Eucalyptus ordiana* (P2), *Triodia cremnophila* (P1) as definitive dominants, plus the creeping perennial herb *Jacquemontia* sp. Keep River (P1) as an occasional associated taxon. Individuals of *Eucalyptus ordiana* (P2) and *Jacquemontia* sp. Keep River (P1) were not detected within the Matsu Project area but are known to occur within the CL community further north (APM 2012). Potential impacts to *Eucalyptus ordiana* and *Jacquemontia* sp. Keep River resulting from development of the Matsu Project Area will require management. *Triodia cremnophila* was detected within the Matsu Project Area and appears to be endemic to the southern reaches of the Rugged Range. Further ground survey work would be highly beneficial and allow a full assessment of the distribution and conservation status of these taxa to be undertaken.

Although the VT vegetation community will not be directly impacted by the development of the Matsu Project area it is anticipated that this vegetation community is dependent on drainage from the Matsu Project area. If the Project has the potential to disrupt drainage patterns, the health of this community may require monitoring as the Project progresses. At present, the composition of the Vine Thicket vegetation community (VT), which is representative of a Priority 1 PEC, is currently unknown and will require further assessment.

The four introduced (weed) species, **Calotropis procera* **Cenchrus americanus* **Melinis repens* and **Passiflora foetida,* were found in vegetation communities that are traversed by the Matsu Access Track (Figure 4-2). Therefore all four species are susceptible to spreading as a result of vehicle or mobile plant movement, related to the re-establishment of the Matsu Access Track and clearing within the Matsu Deposit.

5.2 FAUNA

The development of the Matsu Project may have a negative impact on fauna in several ways. Some of the impacts are short-term and will only be experienced during the construction phase of the Project, while others will be long-term impacts on the biodiversity of the area.

5.2.1 Habitat Loss

The local impact of the clearing will be minor as the clearing area is relatively small and the fauna habitat that will be affected is common in the local region. The fauna habitats that were identified in the Matsu Project area represent common features of the Wickham Land System, characterised by rugged plateaux, ridges and hills formed on sedimentary rocks supporting snappy gum low woodland over soft or curly spinifex, and the smaller Pompey Land System, comprising rugged granite country with sandy soils (Payne and Schoknecht 2011).

As the land systems provide a regional representation of vegetation and soil associations they can be used to calculate the impact of the Matsu Project on the regional fauna habitat. The Wickham Land System consists of numerous sections located throughout the East Kimberley. The section that contains the Matsu Project area is 22,500 ha and, as such, the clearing of 119.8 ha for the Project represents 0.5% habitat loss for the local area. When the entire Wickham Land System is taken into account, which measures 520,000 ha, the regional habitat loss will amount to 0.02%. The Access Track passes through the largest discrete unit of the Pompey Land System which has a total size of 164,800 ha. The potential impact area of the access track is 7.2 ha, representing a maximum potential disturbance area of less than 0.001%.

Given the size and regional representation of the Wickham and Pompey Land Systems, the Project is expected to only have a minor impact on the fauna habitat available in the region.

The sandstone cliff face and the creekline at the bottom of the slope in the Matsu Project area both support unique or diversity rich fauna assemblages. In general a cliff face habitat supports a fauna assemblage with a high percentage of habitat specialists. In the Matsu Project Area this is shown by the presence of Short-eared Rock-wallabies, Sandstone Shrike-thrush, White-quilled Rock-pigeon and two bat species of conservation significance.

As mining at Matsu is to take place on the back slope, this should protect the cliff face habitat from disturbance. However, to ensure the protection of the escarpment a buffer zone will need to be implemented between the edge of the mining pit and the edge of the escarpment.

The creekline has the potential to be indirectly impacted by the Matsu mining operation. The mine pit and construction of waste rock dumps in the valley at the base of the Matsu deposit will result in the diversion of rainfall runoff from the surrounding south-eastern slopes away from the creekline. However, due to the high amount of rain that falls during the wet season (> 590 mm) the effect is likely to be minimal, with the creek still being saturated and flowing in the wet season.

The creation of the Access Track from the existing RIOP mine site to the Matsu Deposit will result in the clearing of approximately 7.2 ha of vegetation. However KMG has opted for a refurbishment of an existing historical four wheel drive exploration track instead of creating a new track. The historical track was originally created in the 1960s. The historical track remains in place with large areas still clear of vegetation, therefore the clearing of the pre-existing access track to create the Access Track will result in minimal habitat loss.

The clearing of vegetation along a linear area, such as the Access Track, has the potential to lead to fragmentation of the surrounding habitat. This is less so the case with the Matsu Access Track as it will be created on the natural boundary between two habitat types, the sandstone cliff and the open

Eucalyptus/*Corymbia* woodland. However, it will be a potential impact for species that are transient between two habitats, such as small mammals that refuge in the sandstone cliff and forage in the stony slopes.

5.2.2 Mortality

Clearing will likely result in localised deaths of native non-volant fauna. However, the extent and intensity of the impact is not considered significant enough to impact species richness and diversity beyond the individual level. Moreover, very few conservation significant fauna species are likely to occur in the areas proposed to be cleared. Biodiversity will be maintained through the maintenance of local populations of fauna distributed beyond the clearing area for the Matsu Project area.

5.2.3 Conservation Significant Species

Two bat species of conservation significance, Orange Leafnosed-bat and Ghost Bat have been recorded above the caves in the cliff face in the Matsu Project area and another species, Northern Leafnosed-bat, has been recorded in the RIOP area in identical habitat and, therefore, has the potential to occur in the Matsu Project area. The construction and operation of the Matsu Project should not interfere with these species as mining will take place on the back slope, leaving the cliff face untouched. The proposed buffer between the edge of the pit and the edge of the escarpment will further ensure that the cliff face remains undisturbed. Noise and light disturbance is unlikely to displace the animals as experience from other locations have shown that these bats remain present in areas that have mid to high levels of human activity. Northern Leafnosed-bats have remained in large crevices on the cliff faces immediately adjunct the Sam pit in the RIOP, and after large scale open cut mining on Koolan Island. (Bullen unpublished).

The Peregrine Falcon uses steep cliffs for nesting and has the potential to use the sandstone cliffs in the Matsu Project area for breeding. While in the nesting stage the species is extremely sensitive and might abandon their nestlings when disturbed. This species was recorded over the backslope of the Sam Deposit of the RIOP in 2009. However, no white faecal smears, characteristic of nesting sites of the Peregrine Falcon, were observed along the cliffs.

The Fork-tailed Swift is a migratory species, which is almost exclusively aerial, only landing to breed. As this species is a non-breeding visitor to Australia the Matsu Project is not expected to impact the local population.

The Rainbow Bee-eater is protected in the *EPBC Act* as a 'Migratory' species; however, not all individuals of the species migrate. Populations that breed in the north of Australia are considered to be resident. This species is abundant in northern Australia and is regularly recorded in disturbed habitats such as roadside vegetation, quarries and mines. Due to its wide distribution and abundance in disturbed habitats the Matsu Project is not expected to have a significant impact on the population of Rainbow Bee-eaters.

The Gouldian Finch is distributed throughout the Kimberley and is generally classed as moderately common in the North, Central and East Kimberley and the lower Ord drainage area, while uncommon or scarce in most of the South Kimberley (Johnstone and Storr 2004). While the Gouldian Finch was not recorded in the Matsu Project Area, it has been recorded from adjacent ridges and the RIOP mining camp. A key threatening process for the Gouldian Finch is the destruction of potential nest sites. The species is an obligate cavity-nesting species and utilises smooth barked *Eucalyptus* and *Corymbia* species on rocky hills. The Matsu Project Area represents potential suitable breeding habitat.

Habitat surveys conducted across the RIOP area by APM in 2010 (Appendix 11) showed the density of suitable nesting hollows at RIOP (1.94 hollows/ha) to be lower than reported by other studies (4.6-27 hollows/ha; Gibbons and Lindenmayer 2002, Brazill-Boast *et al*. 2010). Thus the potential for nesting on the RIOP mine site appears to be low compared to other locations. KMG is currently undertaking an artificial nest box program to offset the loss of natural tree hollows removed during current operations. To date, a total of 130 artificial nest

boxes across four different sites have been established to create alternative breeding sites. Gouldian Finches were observed using the nest boxes within six weeks of placement (S. Pryke pers. comm. 2011). Artificial nest boxes are known to increase natural breeding densities and fledging success (Brazill-Boast *et al*. 2012); therefore the local population of Gouldian Finch is not expected to be negatively impacted as the artificial nest boxes offset the loss of natural hollows and even increases fecundity.

The Pictorella Mannikin is a partly granivorous bird that can be found feeding on grass seeds in the vicinity of water. It is expected to occur along the creekline in the Matsu Project area when key grasses species are seeding. The Matsu Project is expected to have only a minor effect on this species given the small amount of feeding habitat that will be removed.

5.2.4 Short Range Endemics

Short Range Endemics are species with a naturally small range of less than 10,000 km^2 that occupy unique habitats that are broadly separated from each other. They are further characterised by poor dispersal capabilities and low fecundity. These animals would be impacted by the Matsu Project if suitable disjunct habitats are destroyed or if these habitats become further isolated.

However, the habitat present in the Matsu Project area is common and continuous throughout the area and the area proposed for clearing is relatively small. Consequently, the Matsu Project is not expected to have an adverse impact on populations of short range endemics.

5.2.5 Feral Animals

Project development often leads to an increase in feral predators as new roads create corridors to new habitats. Cats are listed under the *EPBC Act* as invasive species and are of conservation significance due to the negative impact they have on native wildlife. Cats have not been observed in the RIOP, but have been observed at Argyle and are therefore expected to infiltrate the Matsu Project once operational.

Cane Toads are also ubiquitous throughout the RIOP and Argyle mine site areas. The development at the Matsu Project is not expected to significantly increase populations of this species.

6 CLEARING PRINCIPLES

Land clearing activities associated with the Matsu Project are considered below against the ten clearing principles outlined in Schedule 5 of the *Environmental Protection Amendment Act 2003*.

1) Native vegetation should not be cleared if it comprises a high level of biological diversity.

No Threatened Flora pursuant to the *WC Act*, were recorded in the Matsu Project area. There were no TEC's recorded within or adjacent to the Matsu Project Area. A vegetation community associated with the Matsu cliff surfaces (CL) was identified as the Priority 1 PEC 'Plant assemblages on vertical sandstone surfaces'. Additionally, a plant community occurring just outside the Matsu Project area was mapped as VT (Figure 4-1) and described to be similar to the Priority 1 PEC 'Monsoon Vine Thicket'.

The CL PEC is unlikely to be significantly impacted as the Matsu Deposit mining operations will occur on the back slope to protect the cliff face from disturbance. Additionally to ensure protection of the escarpment a buffer zone will be implemented between the excavations and escarpment. There is potential for minimal impact resulting from re-establishment of the Access Track where it follows the cliff edges near the southern boundary of the alignment (Figure 4-2). However, the CL community is locally widespread and continues north of the Matsu Project area and further south toward Argyle Diamond Mine.

The Matsu Project will impact the EB-w community which includes thickets of *Grevillea minuata* (P4) with scattered individuals of *Brachychiton tridentatus* and *Corymbia cadophora* subsp. *polychroma* however these species are known to occur throughout the North of Sam and Tony iron ore deposits to the north (Ecologia 2005).

It is recommended that a suitably trained person traverse the Access Track route to identify and flag Priority species. The flagged individuals or populations can then be avoided by redirecting the track, where possible.

Additionally a regional survey of *Triodia cremnophila* would enable a better assessment of the extent of impact upon this species. If these precautions are carried out, the proposed developments will not be at variance with Principle 1.

2) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Broad and general database searches identified 31 fauna species of conservation significance potentially occurring within the Matsu Project area. After a critical assessment of habitat availability and analysis of relevant baseline surveys immediately adjacent the Matsu Project area (within 20km), only 11 species of conservation significance were considered likely to occur.

Cats and Cane Toads are listed under the *EPBC Act* (1999) as invasive species and are of conservation significance due to the negative impact they have on native wildlife. Cats have not been observed in the area, but are expected to occur. Cane Toads have been recorded in high numbers during the Matsu field survey and are common in the local area. Given the presence of existing populations of Cats and Cane toads and the nature of the operations forecast for the Matsu Deposit (mining without a requirement for accommodation camps), the clearing for the Matsu Project is not expected to enhance the populations of either species.

Two bat species of conservation significance, Orange Leafnosed-bat and Ghost Bat have been recorded above the caves in the cliff face in the Matsu Project area and another species, Northern Leafnosed-bat, has been recorded in the RIOP area in identical habitat and, therefore, has the potential to occur in the Matsu Project area. The Peregrine Falcon uses steep cliffs for nesting and has the potential to use the sandstone cliffs in the Matsu Project area, having previously been recorded south at Argyle Diamond Mine and north in the RIOP.

The construction and operation of the Matsu Project should not interfere with these species as mining will take place on the back slope, leaving the cliff face untouched. The proposed buffer between the edge of the pit and the edge of the escarpment will further ensure that the cliff face remains undisturbed.

The Matsu Project will not decrease habitat availability for the aerial Fork-tailed Swift and the development may create nesting habitat for the Rainbow Bee-eater which is regularly recorded in disturbed habitats such as roadside vegetation, quarries and mines.

Clearing of potential nesting sites for the Gouldian Finch that may arise out of clearing will be offset by an extension of the ongoing Gouldian Finch Nest Box installation program first implemented at the RIOP in 2010. Artificial nest boxes are known to increase natural breeding densities and fledging success (Brazill-Boast *et al*. 2012); therefore the local population of Gouldian Finch is not expected to be negatively impacted as the artificial nest boxes offset the loss of natural hollows and even increases fecundity.

The Pictorella Mannikin may lose feeding habitat as grasslands are cleared. However, this habitat is not well represented in the project area.

Provided that suitable management measures are implemented for the relevant conservation significant fauna, clearing for the Matsu Project is not at variance with Principle 2.

3) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

None of the flora surveys undertaken in the vicinity of the Matsu Project area, nor the ground survey work undertaken for the current report have ever recorded any Threatened Flora. The Matsu Project Area is therefore considered not likely to contain DRF or to be at variance with Principle 3.

4) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.

There are no known occurrences of TECs within the Matsu Project Area of in adjacent areas. The proposed developments are not considered to be at variance with Principle 4.

5) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

The Matsu Project Area does not comprise an isolated remnant of intact vegetation. Therefore, the proposed developments are not likely to be at variance with Principle 5.

6) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

The degree to which the P1 Vine thicket community is dependent upon drainage from the Matsu Project Area is not yet known. Although this community will not be impacted directly, it may be dependent on drainage, in the form of surface water channels or rock seepage, from the Matsu Project Area. Therefore health monitoring of Vine Thicket Community is recommended to remain compliant with this clearing principle.

7) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

No appreciable land degradation is likely to arise as a result of clearing activities for the Matsu Project Area. The surface soils consist of gravelly loamy sands that are structurally stable and non-dispersive. Negligible surface water flow and sediment loss occurs in response to the high infiltration capacity of the soils and the

presence of substantial gravels and rock fragments on the surface, which reduces the flow velocity of overland flow, minimizes the potential for sediment detachment and erosion. In addition, extensive rock armouring occurs over most surfaces which further protect the land surface from erosion and subsequent degradation. Additionally the Access Track follows a previously established historical track, therefore minimal land degradation will occur as a result re-establishing this track. Therefore land clearing will not be at variance to principle 7.

Four weeds species are present within the Matsu Project Area, of these, **Calotropis procera and *Passiflora foetida* are classified as 'invasive' under the Invasive Plant Prioritisation Process (DEC 2012b). Therefore APM recommends developing weed management measures prior to any vehicle movement or clearing to ensure weed species do not spread from infested to non-infested areas. If the weed management measures are implemented, the proposed developments are not likely to be at variance with Principle 7.

8) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

The Matsu Project area is not located within or adjacent to any conservation reserves. The proposed developments are not considered to be at variance with Principle 8.

9) Native vegetation should not be cleared if the clearing of native vegetation is likely to cause deterioration in the quality of surface or underground water.

The anticipated clearing is not expected to have a detrimental impact on surface or groundwater quality. However management measures will be implemented to reduce sediment impacts and monitor water quality.

Creeks and drainage lines will be avoided during the development of site infrastructure and pits where possible. If creeks or drainage lines will be impacted a *Permit to Interfere with Bed and Banks* will be obtained through the Department of Water (DoW) under the *Rights in Water and Irrigation Act 1914* prior to any ground disturbance occurring. Adequate culverts will be installed to avoid impeding natural drainage lines and appropriately designed and located surface water diversion bunds and sediment trapping devices will be installed to ensure that potentially sediment laden waters do not enter the adjacent environment.

Upon cessation of mining the pits will be backfilled to minimise the potential for water ponding. The rehabilitated backfilled mine surface and post-mine landforms will be designed such that they do not impede or impact on surface water hydrology along the escarpment, and thus no impacts to surface water flows are expected to occur.

No impact on groundwater resources is expected as the water requirements for the proposed mine site are predicted to be relatively small and any abstraction will be undertaken in a sustainable manner. If the above precautions and operating procedures are adhered to, land clearing and ground disturbance will not be at variance to principle 9.

10) Native vegetation should not be cleared if the clearing of native vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Land clearing is not expected to increase the incidence or intensity of flooding as the properties of the surface soils (i.e. high infiltration rates and gravelly and rocky surface cover materials) will promote vertical infiltration of rainfall and deep recharge of the soil profile. It is therefore not expected that land clearing will significantly increase surface water runoff and subsequent flooding of low-lying areas. In addition, groundwater generally occurs at considerable depths below the surface and any increase in recharge in response to land clearing is not expected to cause an appreciable rise in groundwater levels.

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8 APPENDICES

APPENDIX 1: DEFINITIONS OF CONSERVATION CODES

EPBC Act and WA Wildlife Conservation Act definitions

Schedule 1: Fauna that are rare or likely to become extinct.
Schedule 2: Fauna presumed to be extinct.
Schedule 3: Migratory birds that are listed under JAMBA.
Schedule 4: Other specially protected fauna.

Extinct: Taxa not definitely located in the wild during the past 50 years.
Extinct in the wild: Taxa known to survive only in captivity.
Critically Endangered: Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered: Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable: Taxa facing a very high risk of extinction in the wild in the medium-term future.
Near Threatened: Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent: Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.
Data Deficient: Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern: Taxa that are not Threatened.

Priority 1: Taxa with few, poorly known populations on threatened lands.
Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority 2: Taxa with few, poorly known populations on conservation lands.
Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority 3: Taxa with several, poorly known populations, some on conservation lands.
Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority 4: 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.

Priority 5: Taxa in need of monitoring.
Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

APPENDIX 2: EPBC ACT PROTECTED MATTERS REPORT

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

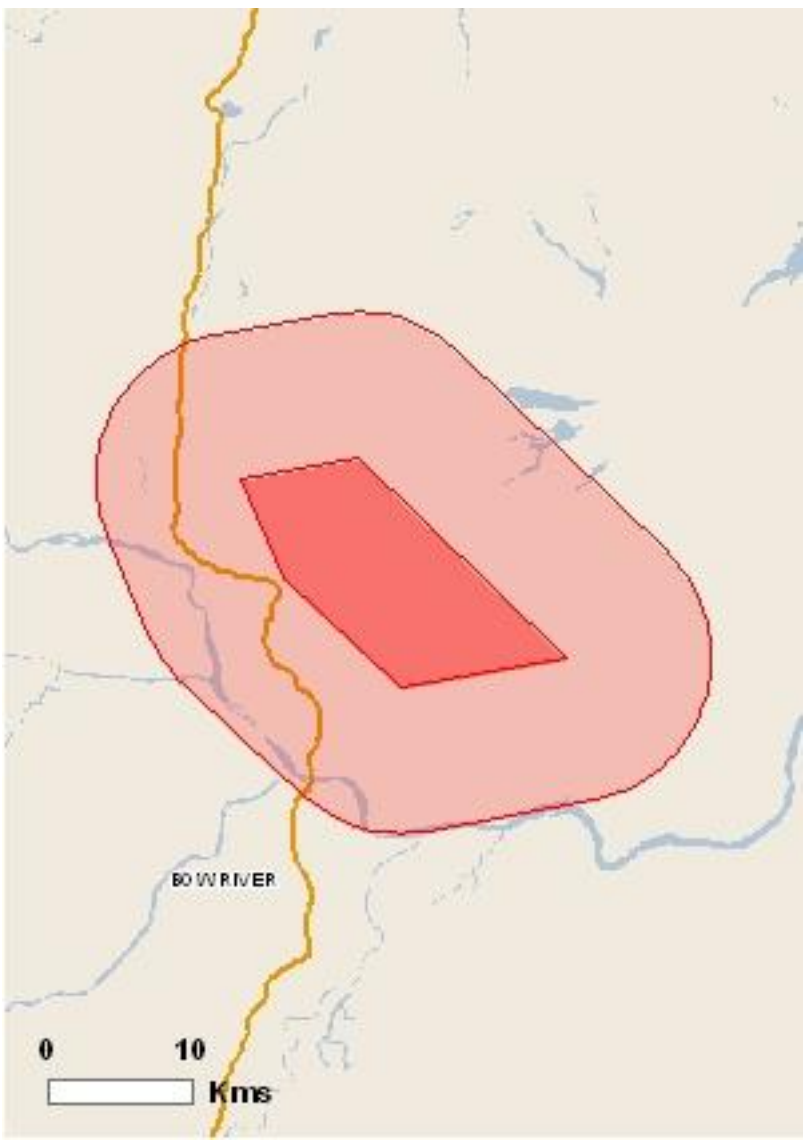
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

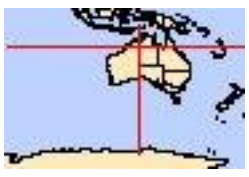
Report created: 21/03/12 17:19:38



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 10.0Km



Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	5
Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

Place on the RNE:	1
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	7
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance (RAMSAR)	[Resource Information]
Name	Proximity
Lake argyle and lake kununurra	Within 10km of Ramsar
Ord river floodplain	Upstream from Ramsar

Threatened Species		[Resource Information]
Name	Status	Type of Presence
BIRDS		

Name	Status	Type of Presence
Erythrura gouldiae		
Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Malurus coronatus coronatus		
Purple-crowned Fairy-wren (western) [64442]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat likely to occur within area
MAMMALS		
Dasyurus hallucatus		
Northern Quoll [331]	Endangered	Species or species habitat likely to occur within area
SHARKS		
Pristis microdon		
Freshwater Sawfish [66182]	Vulnerable	Species or species habitat likely to occur within area

Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Marine Species		
Crocodylus porosus		
Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Erythrura gouldiae		
Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum		
Oriental Pratincole [840]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
[Rostratula benghalensis s. lat.]		
Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
[Anseranas semipalmata]		
Magpie Goose [978]		Species or species habitat may occur within area
[Apus pacificus]		
Fork-tailed Swift [678]		Species or species habitat may occur within area
[Ardea alba]		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
[Ardea ibis]		
Cattle Egret [59542]		Species or species habitat may occur within area
[Charadrius veredus]		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
[Glareola maldivarum]		
Oriental Pratincole [840]		Species or species habitat may occur within area
[Haliaeetus leucogaster]		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
[Merops ornatus]		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
[Rostratula benghalensis s. lat.]		
Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area
Reptiles		
[Crocodylus johnstoni]		
Freshwater Crocodile, Johnston's Crocodile, Johnston's River Crocodile [1773]		Species or species habitat may occur within area
[Crocodylus porosus]		
Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Parts of the Kimberley	WA	Indicative Place

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit,

Name	Status	Type of Presence
Frogs		
Bufo marinus Cane Toad [1772]		Species or species habitat likely to occur within area
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Plants		
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area

Coordinates

-16.60564 128.23663,-16.59255 128.3104,-16.71747 128.44008,-16.73651 128.33657, -16.6681 128.26281,-16.60564 128.23723,-16.60564 128.23663

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Sustainability, Environment, Water, Population and Communities
GPO Box 787

APPENDIX 3: NVIS HIERARCHY FOR VEGETATION MAPPING

NVIS Hierarchy Vegetation Mapping

Hierarchical Level	Description	NVIS structural/floristic components required
I	**Class***	Dominant growth form for the ecologically or structurally dominant stratum
II	**Structural Formation***	Dominant growth form, cover and height for the ecologically or structurally dominant stratum.
III	**Broad Floristic Formation****	Dominant growth form, cover, height and dominant land cover genus for the upper most or the ecologically or structurally dominant stratum.
IV	**Sub-Formation****	Dominant growth form, cover, height and dominant genus for each of the three traditional strata. (i.e. Upper, Mid and Ground)
V	**Association****	Dominant growth form, height, cover and species (3 species) for the three traditional strata. (i.e. Upper, Mid and Ground)
VI	**Sub-Association****	Dominant growth form, height, cover and species (5 species) for all layers/sub-strata.

* Walker & Hopkins 1990
** NVIS (defined for the NVIS Information Hierarchy)

APPENDIX 4: FULL FLORA SPECIES LIST

Full Flora Species List

Acanthaceae
Dicliptera armata
Hypoestes floribunda

Aizoaceae
Trianthema ufoensis

Amaranthaceae
Achyranthes aspera
Ptilotus fusiformis

Anacardiaceae
Buchanania oblongifolia

Apocynaceae
**Calotropis procera*
Carissa lanceolata
Tylophora flexuosa
Wrightia saligna

Asteraceae
Cyanthillium cinereum

Bignoniaceae
Dolichandrone heterophylla

Bixaceae
Cochlospermum fraseri

Boraginaceae
Ehretia saligna
Heliotropium aff. *tenuifolium*

Cannabaceae
Celtis philippensis
Trema tomentose var. *aspera*

Capparaceae
Capparis lasiantha
Capparis umbonata

Caryophyllaceae
Polycarpaea involucrata

Celastraceae
Denhamia obscura
Stackhousia intermedia

Cleomaceae

Cleome viscosa

Combretaceae
Terminalia canescens
Terminalia ferdinandiana

Convolvulaceae
Evolvulus alsinoides var. decumbens
Ipomoea eriocarpa
Jacquemontia sp. Keep River (J.L. Egan 5051) (P1)
Xenostegia tridentata

Cupressaceae
Callitris columellaris

Cyperaceae
Bulbostylis barbata
Cyperus aquatilis
Cyperus cunninghamii subsp*. uniflorus*
Scleria aff. brownii

Erythroxylaceae
Erythroxylum ellipticum

Euphorbiaceae
Euphorbia alsiniflora
Euphorbia drummondii
Euphorbia schultzii

Fabaceae
Acacia aff. asperulacea
Acacia lamprocarpa
Acacia multisiliqua
Acacia retivenea subsp*. retivenea*
Acacia thomsonii
Acacia translucens
Canavalia papuana
Chamaecrista absus
Christia australasica
Crotalaria retusa
Desmodium brownii
Erythrophleum chlorostachys
Galactia tenuiflora
Indigofera linifolia
Indigofera linnaei
Indigofera sp. A Kimberley Flora (G.J. Keighery & N. Gibson 70)
Mirbelia viminalis

Tephrosia phaeosperma
Tephrosia virens
Uraria lagopodioides
Zornia muriculata

Goodeniaceae
Goodenia sepalosa var*. sepalosa*

Lamiaceae
Clerodendrum floribundum var*. floribundum*
Clerodendrum tomentosum var*. tomentosum*

Loranthaceae
Amyema eburna
Amyema sp.

Malvaceae
Abutilon otocarpum
Adansonia gregorii
Brachychiton tridentatus (P3)
Brachychiton viscidulus
Corchorus sidoides
Gossypium australe
Melhania oblongifolia
Sida rohlenae
Sida sp. A Kimberley Flora (P.A. Fryxell & L.A. Craven 3900)
Triumfetta clivorum
Triumfetta plumigera
Triumfetta triandra

Meliaceae
Owenia vernicosa

Moraceae
Ficus aculeata var*. indecora*
Ficus atricha
Ficus brachypoda

Myrtaceae
Calytrix exstipulata (rock form)
Calytrix exstipulata (shrub form)
Corymbia aspera
Corymbia cadophora subsp. *polychroma* (P1)
Corymbia collina
Corymbia dichromophloia
Corymbia disjuncta
Eucalyptus brevifolia
Eucalyptus confluens
Eucalyptus jensenii

Eucalyptus ordiana (P2)
Kunzea sp. Keep River (Currently nominated for priority status)

Oleaceae
Jasminum molle
Opiliaceae
Opilia amentacea

Orobanchaceae
Buchnera ramosissima

Passifloraceae
**Passiflora foetida*

Phyllanthaceae
Flueggea virosa subsp*. melanthesoides*
Phyllanthus exilis
Phyllanthus grandisepalus

Picrodendraceae
Petalostigma quadriloculare

Pittosporaceae
Pittosporum spinescens

Plantaginaceae
Stemodia lythrifolia

Poaceae
**Cenchrus americanus*
Chrysopogon setifolius
Cymbopogon ambiguus
Eriachne ciliata
Eriachne aff*. mucronata*
Heteropogon contortus
**Melinis repens*
Panicum decompositum
Panicum seminudum var*. cairnsianum*
Schizachyrium fragile
Triodia aff. bitextura
Triodia cremnophila (P1)
Triodia sp. Argyle (aff. cunninghamii) (Currently nominated for priority status)
Yakirra australiensis

Polygalaceae
Comesperma secundum

Portulacaceae
Portulaca bicolor

Proteaceae

Grevillea agrifolia

Grevillea dryandri subsp. dryandri

Grevillea heliosperma

Grevillea mimosoides

Grevillea miniata (P4)

Grevillea pyramidalis subsp. *leucadendron*

Grevillea refracta

Grevillea velutinella

Persoonia falcata

Stenocarpus acacioides

Pteridaceae

Cheilanthes brownii

Rubiaceae

Gardenia resinosa subsp. *resinosa*

Oldenlandia kochiae

Psydrax attenuata

Spermacoce phaeosperma

Spermacoce sp.

Santalaceae

Santalum lanceolatum

Sapindaceae

Atalaya salicifolia

Dodonaea hispidula var. *arida*

Solanaceae

Solanum cunninghamii

APPENDIX 5: PRIORITY ECOLOGICAL COMMUNITY LIST

PRIORITY ECOLOGICAL COMMUNITIES FOR WESTERN AUSTRALIA VERSION 17

Species and Communities Branch, Department of Environment and Conservation

13 April 2012

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority ecological community list under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Note:

i) Nothing in this table may be construed as a nomination for listing under the Commonwealth EPBC Act 1999.

ii) The inclusion in this table of a community type does not necessarily imply any status as a threatened ecological community.

iii) Regions eg Pilbara are based on Department of Environment and Conservation regional boundaries.

iv) For definitions of categories (Priority 1 etc.) refer to document entitled 'Definitions and Categories'.

	Community name	Category
	Pilbara	
1	**West Angelas Cracking-Clays**	Priority 1
	Open tussock grasslands of *Astrebla pectinata, A. elymoides, Aristida latifolia* , in combination with *Astrebla squarrosa* and low scattered shrubs of *Sida fibulifera* , on basalt derived cracking-clay loam depressions and flowlines.	
	Threats: Disturbance footprints increasing from mine, future infrastructure development, possible weed invasion and changes in fire regime.	
2	**Weeli Wolli Spring community**	Priority 1
	Weeli Wolli Spring's riparian woodland and forest associations are unusual as a consequence of the composition of the understorey. The sedge and herbfield communities that fringe many of the pools and associated water bodies along the main channels of Weeli Wolli Creek have not been recorded from any other wetland site in the Pilbara. The spring and creekline are also noted for their relatively high diversity of stygofauna and this is probably attributed to the large-scale calcrete and alluvial aquifer system associated with the creek. The valley of Weeli Wolli Spring also supports a very rich microbat assemblage including a threatened species.	
	Threats: dewatering and re-watering altering patterns of inundation, weed invasion	
3	**Burrup Peninsula rock pool communities**	Priority 1
	Calcareous tufa deposits. Interesting aquatic snails.	
	Threats: recreational impacts, and potential development; possibly NOX and SOX emissions.	
4	**Burrup Peninsula rock pile communities**	Priority 1
	Comprise a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Short-range endemic land snails.	
	Threats: industrial development.	
5	**Roebourne Plains coastal grasslands with gilgai microrelief on deep cracking clays** (Roebourne Plains gilgai grasslands)	Priority 1
	The Roebourne Plains coastal grasslands with gilgai micro-relief occur on deep cracking clays that are self mulching and emerge on depositional surfaces. The Roebourne Plains gilgai grasslands occur on microrelief of deep cracking clays, surrounded by clay plains/flats and sandy coastal and alluvial plains. The gilgai depressions supports ephemeral and perennial tussock grasslands dominated by *Sorghum* sp. and *Eragrostis xerophila* (Roebourne Plains grass) along with other native species including *Astrebla pectinata* (barley mitchell grass), *Eriachne benthamii* (swamp wanderrie grass), *Chrysopogon fallax* (golden beard grass) and *Panicum decompositum* (native millet). Restricted to the Karratha area, this community differs from the surrounding clay flats of the Horseflat land system which are dominated by *Eragrostis xerophila* and other perennial tussock grass species (*Eragrostis* mostly).	
	Threats: Grazing, clearing for mining and infrastructure and urban development, weed invasion, basic raw material extraction.	
6	**Stony Chenopod association of the Roebourne Plains area**	Priority 1
	The community is dominated by *Eragrostis xerophila* and chenopods growing in saline clay soils with dense surface strew of pebbles and cobbles. The association appears to be uncommon and is likely to be linked with the Cheerawarra land system (Unit 3 - Saline clay plains). Only one occurrence has been located to date (Roebourne Airport), however it is likely some other small areas remain.	
	Threats: grazing, clearing, and weeds especially buffel grass	

7	**Barrow Island subterranean fauna**	Priority 1
	Barrow Island stygofauna and troglofauna.	
	Threats: Mining and industrial development.	
8	**Subterranean invertebrate communities of mesas in the Robe Valley region**	Priority 1
	A series of isolated mesas occur in the Robe Valley in the state's Pilbara Region. The mesas are remnants of old valley infill deposits of the palaeo Robe River. The troglobitic faunal communities occur in an extremely specialised habitat and appear to require the particular structure and hydrogeology associated with mesas to provide a suitable humid habitat. Short range endemism is common in the fauna. The habitat is the humidified pisolitic strata.	
	Threats: Mining	
9	**Subterranean invertebrate community of pisolitic hills in the Pilbara**	Priority 1
	A series of isolated low undulating hills occur in the state's Pilbara region. The troglofauna are being identified as having very short range distributions.	
	Threats: mining	
10	**Peedamulla Marsh vegetation complex**	Priority 1
	Peedamulla (Cane River) Swamp Cyperaceae community, near mouth of Cane River. Plants are unusual.	
	Threats: grazing, weed invasion, altered surface hydrologic flows.	
11	***Triodia angusta* dominated creekline vegetation (Barrow Island)**	Priority 1
	General cover of *Triodia angusta* with shrubs principally *Hakea suberea* , *Petalostylis labicheoides, Acacia bivenosa* , and *Gossypium robinsonii* .	
	Threats: basic raw material extraction for island infrastructure.	
12	**Brockman Iron cracking clay communities of the Hamersley Range**	Priority 1
	Rare tussock grassland dominated by *Astrebla lappacea* in the Hamersley Range, on the Newman land system. Tussock grassland on cracking clays- derived in valley floors, depositional floors. This is a rare community and the landform is rare. Known from near West Angeles, Newman, Tom Price and boundary of Hamersley and Brockman Stations.	
	Threats: Heavily grazed, mining and infrastructure developments.	
13	**Sand Sheet vegetation (Robe Valley)**	Priority 1
	Corymbia zygophylla scattered low trees over *Acacia tumida* var. *pilbarensis* , *Grevillea eriostachya* high shrubland over *Triodia schinzii* hummock grassland. Other associated species include *Cleome uncifera* , *Heliotropium transforme* , *Indigofera boviperda* subsp. *boviperda* , and *Ptilotus arthrolasius* .	
	Most northern example/expression of vegetation of Carnarvon Basin. Community is poorly represented type in the Pilbara Region, and not represented in the reserve system. Community contains many plant species that are at their northern limits or exist as disjunct populations. Vulnerable to invasion by weeds.	
	Threats: mining, basic raw material extraction, weed invasion especially buffel grass.	
14	**Mingah Springs calcrete groundwater assemblage type on Gascoyne palaeodrainage on Mingah Spring Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
15	**Coastal dune native tussock grassland dominated by *Whiteochloa airoides***	Priority 1
	Tussock grassland of *Whiteochloa airoides* occurs on the landward side of foredunes, hind dunes or remnant dunes with white or pinkish white medium sands with marine fragments. There may be occasional *Spinifex longifolius* tussock or *Triodia epactia* hummock grasses and scattered low shrubs of *Olearia dampierii* subsp. *dampierii* , *Scaevola spinescen* s, *S. cunninghamii, Trianthema turgidifolia* and *Corchorus* species (*C. walcottii, C. laniflorus*).	
	Occurs on Barrow Island and possibly some unaffected littoral areas in West Pilbara.	
	Threats: weed invasion especially buffel grass and kapok, basic raw material extraction.	
16	**Freshwater claypans of the Fortescue Valley**	Priority 1
	Freshwater claypans downstream of the Fortescue Marsh - Goodiadarrie Hills on Mulga Downs Station.	
	Important for waterbirds, invertebrates and some poorly collected plants. *Eriachne* spp., *Eragrostis* spp. grasslands. Unique community, has few Coolabah.	
	Threats: weed invasion, infrastructure corridors, altered hydrological flows, inappropriate fire regimes.	

17	**Fortescue Marsh (Marsh Land System)**	Priority 1
	Fortescue Marsh is an extensive, episodically inundated samphire marsh at the upper terminus of the Fortescue River and the western end of Goodiadarrie Hills. It is regarded as the largest ephemeral wetland in the Pilbara. It is a highly diverse ecosystem with fringing mulga woodlands (on the northern side), samphire shrublands and groundwater dependant riparian ecosystems. It is an arid wetland utilized by waterbirds and supports a rich diversity of restricted aquatic and terrestrial invertebrates. Recorded locality for night parrot and bilby and several other threatened vertebrate fauna. Endemic *Eremophila* species, populations of priority flora and several near endemic and new to science samphires.	
	Threats: mining, altered hydrology (watering with fresh water), grazing and weed invasion.	
18	**Tanpool land system**	Priority 1
	A highly restricted land system that occurs between Pannawonica and Onslow. Consists of stony plains and low ridges of sandstone and other sedimentary rocks supporting hard spinifex grasslands and snakewood shrublands.	
	Threats: grazing	
19	**Stygofaunal community of the Bungaroo Aquifer**	Priority 1
	A unique assemblage of aquatic subterranean fauna including eels, snails and other stygofauna.	
	Threats: groundwater drawdown, mining.	
20	**Coolibah-lignum flats**: ***Eucalyptus victrix*** **over** ***Muehlenbeckia*** **community**	
	Woodland or forest of *Eucalyptus victrix* (coolibah) over thicket of *Muehlenbeckia florulenta* (lignum) on red clays in run-on zones. Associated species include *Eriachne benthamii, Themeda triandra, Aristida latifolia, Eulalia aurea* and *Acacia aneura* . A series of sub-types have been identified:	
	• Coolibah and mulga (*Acacia aneura*) woodland over lignum and tussock grasses on clay plains (Coondewanna Flats and Wanna Munna Flats)	Priority 3(i)
	• Coolibah woodlands over lignum (*Muehlenbeckia florulenta* **)** over swamp wandiree (Lake Robinson is the only known occurrence)	Priority 1
	• Coolibah woodland over lignum and silky browntop (*Eulalia aurea)* (two occurrences known on Mt Bruce Flats)	Priority 1
	Threats: dewatering and grazing, clearing associated with infrastructure corridors.	
21	**Four plant assemblages of the Wona Land System**	
	(previously 'Cracking clays of the Chichester and Mungaroona Range')	
	A system of basalt upland gilgai plains with tussock grasslands occurs throughout the Chichester Range in the Chichester-Millstream National Park, Mungaroona Range Nature Reserve and on adjacent pastoral leases. There are a series of community types identified within the Wona Land System gilgai plains that are considered susceptible to known threats such as grazing or have constituent rare/restricted species, as follows:	
	• Cracking clays of the Chichester and Mungaroona Range. This grassless plain of stony gibber community occurs on the tablelands with very little vegetative cover during the dry season, however during the wet a suite of ephemerals/annuals and short-lived perennials emerge, many of which are poorly known and range-end taxa.	Priority 1
	• Annual Sorghum grasslands on self mulching clays. This community appears very rare and restricted to the Pannawonica-Robe valley end of Chichester Range.	Priority 1
	• Mitchell grass plains (*Astrebela* spp.) on gilgai	Priority 3(iii)
	• Mitchell grass and Roebourne Plain grass (*Eragrostis xerophila*) plain on gilgai (typical type, heavily grazed	Priority 3(iii)
22	**Tussock grasslands or grassy tall or low shrublands of the Yarcowie Land System (Carnarvon Basin)**	Priority 1
	Gilgaied soils derived from lower cretaceous benthonitic siltstone on nearly flat plains that support tussock grasslands or grassy tall or low shrublands. Land system has very restricted distribution.	
	Threats: over grazing	
23	***Triodia*** **sp. Robe River assemblages of mesas of the West Pilbara** (previously named *'Triodia* sp. Robe River assemblages of mesas of the Robe Valley')	Priority 3(iii)
	This community is typically restricted to mesas and cordillo landforms where the plant assemblages are dominated by or contain *Triodia* sp. Robe River and are indicative of inverted landscapes; that is, where *Triodia* sp. Robe River occurs in combination with species that are considered 'out-of-context' from their normal habitat. The community is a combination of *Triodia* sp. Robe River with *Acacia pruinocarpa, A. citrinoviridis* on slopes or peaks of mesas. These two *Acacias* are generally found associated with Pilbara creeklines, and their occurrence is probably indicative of the genesis of the mesa surfaces in wetlands, then erosion of the landscape and 'inversion of the landscape' such that the mesa slopes and peaks that were previously low in the landscape become high points.	
	Threats: Mining and associated infrastructure	

24	**Stony saline plains of the Mosquito Land System**	Priority 3(iii)
	Described as saltbush community of the duplex plains - Mosquito Creek series (Nullagine). Known to contain two endemic Acacias. One occurrence known on stony plains, and one on rocky ground.	
	Threats: preferential grazing, prospecting and mining, increasing erosion	
25	**Fortescue Valley Sand Dunes**	Priority 3(iii)
	(known previously as 'Sand dune communities of the Fortescue Botanical District')	
	These red linear sand dune communities lie on the Divide Land system at the junction of the Hamersley Range and Fortescue Valley, between Weeli Wolli Creek and the low hills to the west. A small number are vegetated with *Acacia dictyophleba* scattered tall shrubs over *Crotalaria cunninghamii, Trichodesma zeylanicum* var. *grandiflorum* open shrubland. They are regionally rare, small and fragile and highly susceptible to threatening processes.	
	Threats: weed invasion especially buffel grass, and erosion.	
26	**Riparian vegetation including phreatophytic species associated with creek lines and watercourses of Rudall River**	Priority 3(ii)
	Semi permanent pools along courses of Rudall River.	
	Threats**:** weed invasion, altered hydrological flows, inappropriate fire regimes.	
27	**Horseflat land system of the Roebourne Plains**	Priority 3(iii)
	(Does not include priority ecological communities 'Roebourne Plains gilgai grasslands' and the 'Chenopod association of the Roebourne Plains area')	
	The Horseflat Land System of the Roebourne Plains are extensive, weakly gilgaied clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include *Eragrostis xerophila* (Roebourne Plains grass) and other *Eragrostis* spp., *Eriachne* spp. and *Dichanthium* spp. The community also supports a suite of annual grasses including *Sorghum* spp. and rare *Astrebela* spp. The community extends from Cape Preston to Balla Balla surrounding the towns of Karratha and Roebourne.	
	This community incorporates Unit 3 (Gilgai plains), Unit 5 (Alluvial Plains) with some Unit 7 (Drainage Depressions) described in Van Vreeswyk *et al* . 2004.	
	Threats: grazing, weed invasion, fragmentation	
28	**Invertebrate assemblages (Errawallana Spring type) Coolawanya Station**	Priority 4(ii)
	Geologically distinct. Sherlock River system. Permanent spring-fed creek. Has atypical invertebrate community.	
	Threats: grazing.	
29	**Invertebrate assemblages (Nyeetberry Pool type)**	Priority 4(ii)
	Jimmawurrada Creek. Nyeetberry pool, Robe River.	
	Permanent River Pool in the Pilbara (groundwater fed). Blind isopod collected from this site.	
	Threats: mining and feral animals	
30	**Stygofaunal communities of the Western Fortescue Plains freshwater aquifer** (Previously named 'Stygofaunal communities of the Millstream freshwater aquifer')	Priority 4(ii)
	A unique assemblage of subterranean invertebrate fauna.	
	Threats: Groundwater drawdown and salinisation.	
	KIMBERLEY	
1	**Perched spring-fed peat-based swamps on hillslopes of the Durack Range area**	Priority 1
	Assemblages of spring-fed wetlands on organic substrates perched on sandstone hill-slopes in the Central Kimberley bioregion. Drainage lines are vegetated with a forest of *Corymbia ptychocarpa* (swamp bloodwood), *Grevillea pteridifolia, Melaleuca* spp, *Pandanus spiralis* , and some *Livistona* spp. over the fern *Cyclosorus interruptus* and the climbing fern *Lygodium microphyllum* . Sedges occur in the understorey and clumps of Reed Grass *Arundinella nepalensis* are dominant in the understorey where the canopy is more open. Also associated with the drainage lines are swamps vegetated by dense sedgelands with grasses and herbs.	
	Threats: Cattle grazing and weeds.	
2	**Assemblages of Point Spring and Long Swamp rainforest swamps**	Priority 1
	Closed canopy rainforest on freshwater swamps on alluvial floodplain soils in the east Kimberley. Two occurrences are known, these are Point Spring and Long Swamp. At Point Spring the canopy is 17m high and the dominant tree species include *Canarium australianum, Carallia brachiata, Euodia elleryana, Ficus racemosa, F. virens* and *Terminalia sericocarpa* . The rainforest canopy height at Long Swamp is 30m, and the dominant tree species include *Nauclea orientalis, Terminalia sericocarpa* and *Euodia elleryana.* The periphery of the patch is permanently moist and supports a *Melaleuca leucadendra* forest.	
	Threats: Invasion by feral fish, impacts of stock, climate change and rising sea levels.	

3	**Assemblages of the wetlands associated with the organic mound springs on the tidal mudflats of the Victoria-Bonaparte Bioregion**	Priority 1
	East Kimberley (i.e. Brolga Spring, King Gordon Spring, Attack Spring etc on Carlton Hill Station). Large wetlands with Melaleuca forest with small patches of rainforest on central mounds. Rainforest and paperbark forest associated with mound springs and seepage areas of the Victoria Bonaparte coastal lands.	
4	**Monsoon vine thickets and Camaenid land snails of limestone ranges (Napier Range)**	Priority 1
	Unusual vine thicket community and Camaenid land snails assemblage located on Napier Range.	
	Threats: frequent fires leading to vegetation changes; loss of vine thickets and leaf litter	
5	***Oryza australiensis*** **(wild rice) grasslands on alluvial flats of the Ord River**	Priority 1
	West side of Weaber Hills, Weaber Plain, Mantini Flats, Knox Creek.	
6	**Inland Mangrove (*Avicennia marina*) community of Salt Creek**	Priority 1
	Anna Plains Station, Mandora.	
7	**Plant assemblages on vertical sandstone surfaces**	Priority 1
	Eg. Two undescribed spinifex spp. at Bungles and Molly Spring, foxtail spinifex at Cathedral Gorge and Thompsons Spring. Fire sensitive plants, fire regimes a threat.	
8	**Invertebrate community of Napier Range Cave**	Priority 1
	On Old Napier Downs, Karst No. KNI.	
	Threats: Mine close by and tourist visitation.	
9	**Invertebrate assemblages of the cliff foot springs around Devonian reef system**	Priority 1
	Black soils.	
	Threats: Springs drying up due to dewatering of karst systems.	
10	**Dwarf pindan heath community of Broome coast**	Priority 1
	Occurs between the racecourse and Gantheame Point lighthouse. Insufficient survey outside of Broome townsite area to determine full extent. Threats: clearing, trampling, weed invasion, inappropriate fire regimes	
11	***Corymbia paractia*** **dominated community on dunes**	Priority 1
	Corymbia paractia behind dunes, Broome township area, Dampier Peninsula. Transition zone where coastal dunes (with vine thickets) merge with Pindan (desert) vegetation. Also, port north of Broome. Threats: clearing, trampling, weed invasion, inappropriate fire regimes	
12	**Mangarr community on relict dune systems on the Broome Peninsula**	Priority 1
	Contains frequent mature (100 years +) *Sersalisia* (previously *Pouteria) sericea* or otherwise known as Mangarr. Mangarr is a culturally important and renowned local bushtucker species and does not occur in such frequency and longevity in other locations. The community is recorded as a *Eucalyptus, Sersalisia* low woodland unit that occurs on parallel dunes in the area south east of Gantheaume Point. The community also contains numerous woodland species such as: *Erythropleum chlorostachys* (ironwood), *Eucalyptus (Corymbia) zygophylla* (Broome bloodwood), *Hakea macrocarpa* and *Corynotheca micrantha* (zig-zag Lilly). Some species are more reminiscent of desert and aridlands country including: *Solanum cunninghammii* (bush tomato), *Scaevola parvifolia, Goodenia sepalosa, Senna costata, Gyrostemon tepperi* and *Triodia* sp. (spinifex). The extensive stands of Mangarr occur in association with species more often found within the nearby threatened ecological community- Monsoon vine thicket.	
	Threats: weed invasion, grazing, inappropriate fire regime, proposed developments	
13	**Invertebrate community of Tunnel Creek**	Priority 2
	Has unique fauna and has high visitation but not enough data available yet to describe - currently only has one sample site (neighbouring sample areas eg Windjana Gorge have different genera)	
14	**Camaenid land snail and vine thicket assemblage of limestone hills (Jeremiah and Ningbing Ranges)**	Priority 3(iii)
	A suite of species of land snail belonging to the family Camaenidae are only recorded from limestone ranges and outcrops of the East Kimberley. They occur in areas of limited Devonian reef with unusual vine thickets with a boab overstorey. All the Camaenid snails are short-range endemics, with known geographic ranges ranging from 0.01 ha to 5.6 km^2. Twenty critically endangered, four endangered and one vulnerable species occur in the Ningbing Ranges and Jeramiah Hills north of Kununurra.	
	Threats: frequent fires leading to vegetation changes (loss of vine thickets) and leaf litter and grazing impacts, especially on flat-lying fringing limestone pavement areas; mining.	
15	**Assemblages of Disaster Bay organic mound springs**	Priority 3(iii)
	Organic mound springs on tidal flat with *Melaleuca acacioides, Timonius timon, Pandanus spiralis, Melaleuca viridiflora, Acacia neurocarpa* and *Lumnitzera racemosa* (mangrove) woodland with *Typha domingensis* and sedges, including *Schoenoplectus litoralis* . Threats: soil compaction by cattle; potential changes in sea level due to climate change	

16	**Assemblages of Lolly Well Springs wetland complex**	Priority 3(ii)
	Wetland complex containing numerous low organic mound springs with moats. Threats: Recreational use, potential tourism developments, weed invasion, rubbish dumping, grazing and trampling (cattle)	
17	**Nimalaica clay pan community**.	Priority 4(ii)
	Nimalaica claypan is a unique, almost permanent, freshwater lake inland from Willie Creek, Broome	
	Threats: groundwater extraction, causeway construction, feral animals, expansion of township	
	MIDWEST	
1	**Mount Gibson Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
2	**Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
3	**Jack Hills vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
4	**Mount Gould vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
5	**Lake Austin vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
6	**New Forest (including Twin Peaks) vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
7	**Robinson Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
8	**Weld Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
9	**Wolla Wolla (Gullewa) vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
10	**Yalgoo vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
11	**Plant assemblages of the Moresby Range system**	Priority 1
	Includes the *Melaleuca megacephala* and *Hakea pycnoneura* thicket on stony slopes, *Verticordia* dominated low heath, and *Allocasuarina campestris* and *Melaleuca uncinata* thicket on superficial laterite, on Morseby Range.	
	Threats: clearing for infrastructure	
12	**Mount Dugel/Mount Nairn vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
13	**Minjar/Gnows Nest vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
14	**Warriedar Hill/Pinyalling vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
15	**Mount Magnet vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
16	**Tallering Peak vegetation complexes**	Priority 1
	Tallering Peak in the northwest is a massif of banded ironstone and jaspilite, with outcropping masses or rock along the spine. Vegetation is sparse and includes shrubs of only 1.2m of *Acacia quadrimarginea, A ?coolgardiensis, Eremophila leucophylla, Thryptomene johnsonii,* a smaller Baeckea or Thryptomene sp. and *Ptilotus obovatus* .	
	Threats: mining	
17	**Lesueur-Coomallo Floristic Community M2 (*Melaleuca preissiana* woodland)**	Priority 1
	Woodland dominated by *Melaleuca preissiana* along sandy drainage lines, with faithful species of *Anigozanthos pulcherrimus* and constant species of *Chamaescilla corymbosa*, *Petrophile brevifolia* and *Xanthorrhoea reflexa.*	
18	**Lesueur-Coomallo Floristic Community DFGH**	Priority 1
	Mixed species-rich heath on lateritic gravel with *Hakea erinacea, Melaleuca platycalyx* and *Petrophile seminuda:* a fine scale mixture of four floristically-defined communities occurring on lateritic slopes.	

19	**Kalbarri ironstone community**	Priority 1
	Winter wet, mallee/Melaleuca over herbs. Dense shrubland when burnt. Surrounded by sandplain. Yerina springs and north Eurardy Station. Z-bend loop, Junga Dam. The declared rare flora taxon *Eremophila microtheca* occurs in community.	
20	**Shrublands of the Northampton area, dominated by Melaleuca species over exposed Kockatea Shale** Heath on breakaways located in Port Gregory, west of Northampton. Community includes priority taxa; *Ptilotus chortophytum* (P1), *Leucopogon* sp. Port Gregory, *Ozothamnus* sp. Northampton, *Gastrolobium propinquum* (P1), outlier of *Ptilotus helichrysoides* . Unusual geology (Kockatea Shale) outcropping at surface.	Priority 1
21	**Badja calcrete groundwater assemblage type on Moore palaeodrainage on Badja Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
22	**Belele calcrete groundwater assemblage type on Murchison palaeodrainage on Belele Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
23	**Black Range South and Windsor groundwater calcrete assemblage type on Raeside and Murchison palaeodrainage on Lake Mason and Windsor Stations**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
24	**Bunnawarra calcrete groundwater assemblage type on Moore palaeodrainage on Bunnawarra Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
25	**Byro Central and Byro HS calcrete groundwater assemblage types on Murchison palaeodrainage on Byro Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
26	**Challa, Challa North and Wondinong calcrete groundwater assemblage type on Murchison palaeodrainage on Challa and Wondinong Stations**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
27	**Cogla Downs calcrete groundwater assemblage type on Murchison palaeodrainage on Yarrabubba Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
28	**Dalgety and Landor calcrete groundwater assemblage type on Gascoyne palaeodrainage on Dalgety Downs and Landor Stations**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
29	**Doolgunna calcrete groundwater assemblage type on Gascoyne palaeodrainage on Doolgunna Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
30	**Gabyon calcrete groundwater assemblage type on Moore palaeodrainage on Gabyon Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
31	**Gifford Creek, Mangaroon, Wanna calcrete groundwater assemblage type on Lyons palaeodrainage on Gifford Creek, Lyons and Wanna Stations**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
32	**Hillview calcrete groundwater assemblage type on Murchison palaeodrainage on Hillview Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
33	**Innouendy calcrete groundwater assemblage type on Murchison palaeodrainage on Innouendy Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	

34	**Karalundi calcrete groundwater assemblage type on Murchison palaeodrainage on Karalundi Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
35	**Killara calcrete groundwater assemblage types on Murchison palaeodrainage on Killara Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
36	**Killara North calcrete groundwater assemblage types on Murchison palaeodrainage on Killara Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
37	**Lake Austin calcrete groundwater assemblage type on Murchison palaeodrainage on Austin Downs Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
38	**Maranalgo west calcrete assemblage type on Moore palaeodrainage on Maranalgo Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
39	**Meeberrie calcrete groundwater assemblage type on Murchison palaeodrainage on Meeberrie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
40	**Meka calcrete groundwater assemblage type on Murchison palaeodrainage on Meka Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
41	**Milgun central calcrete groundwater assemblage types on Gascoyne palaeodrainage on Milgun Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
42	**Milgun south calcrete groundwater assemblage types on Gascoyne palaeodrainage on Milgun Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
43	**Mount Augustus calcrete groundwater assemblage type on Lyons palaeodrainage on Mount Augustus Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
44	**Mount Narryer calcrete groundwater assemblage type on Murchison palaeodrainage on Mount Narryer Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
45	**Mount Padbury calcrete groundwater assemblage type on Murchison palaeodrainage on Mount Padbury Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
46	**Muralgarra calcrete groundwater assemblage type on Murchison palaeodrainage on Muralgarra Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
47	**Murchison Downs calcrete groundwater assemblage type on Murchison palaeodrainage on Murchison Downs Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
48	**Ninghan calcrete groundwater assemblage type on Moore palaeodrainage on Ninghan Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	

49	**Nowthanna Hill calcrete groundwater assemblage type on Murchison palaeodrainage on Yarrabubba Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
50	**Paroo calcrete groundwater assemblage type on Carey palaeodrainage on Paroo Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
51	**Polelle calcrete groundwater assemblage type on Murchison palaeodrainage on Polelle Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
52	**Taincrow calcrete groundwater assemblage type on Murchison palaeodrainage on Taincrow Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
53	**Three Rivers calcrete groundwater assemblage types on Gascoyne palaeodrainage on Three Rivers Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
54	**Three Rivers Plutonic calcrete groundwater assemblage types on Gascoyne palaeodrainage on Three Rivers Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
55	**Wagga Wagga and Yalgoo calcrete groundwater assemblage type on Yalgoo and Moore palaeodrainage on Wagga Wagga and Bunnawarra Stations**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
56	**Windimurra calcrete groundwater assemblage type on Murchison palaeodrainage on Windimurra Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
57	**Yarrabubba east calcrete groundwater assemblage types on Murchison palaeodrainage on Yarrabubba Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining.	
58	**Yarrabubba west calcrete groundwater assemblage types on Murchison palaeodrainage on Yarrabubba Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining.	
59	**Yoweragabbie calcrete groundwater assemblage type on Moore palaeodrainage on Yoweragabbie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
60	***Claypans with mid dense shrublands of Melaleuca lateritia over herbs** (note: community listed as critically endangered under the federal Environment Protection and Biodiversity Conservation Act 1999)	Priority 1
	Claypans (predominantly basins) usually dominated by a shrubland of *Melaleuca lateritia* occurring both on the coastal plain and the adjacent plateau. These claypans are characterized by aquatic (*Hydrocotyle lemnoides* – Priority 4) and amphibious taxa (e.g. *Glossostigma diandrum* , *Villarsia capitata* and *Eleocharis keigheryi* - DRF)	
61	***Petrophile chrysantha* low heath on Lesueur dissected uplands (Gp200-170)**	Priority 2
	Low heath dominated by *Petrophile chrysantha* on Lesueur Dissected Uplands. Associated species include *Dryandra armata* and *Hakea undulata.*	
62	**Coolabah-lignum swamps**	Priority 3(iii)
	Widely distributed, would need to clarify composition of herbs and extent of specific plant assemblage. Similar assemblage occurs in the Pilbara.	
63	**Fairy Shrimp communities of rock outcrops**	Priority 3(i)
	Invertebrate communities are unusual, some species known from relatively few outcrops but not under imminent threat. Mining could be an issue with regards to dust accumulation as it could affect pool chemistry, and especially with regard to flatter rocks at landscape level.	

64	***Granite outcrop pools with endemic aquatic fauna**	Priority 3(i)
	Freshwater pools formed on granite outcrops that may persist for several months and house a variety of aquatic invertebrates, some of which are endemic to south-west WA. Some examples include cladocerans, ostracods, copepods, rotifers, oligochaetes and molluscs.	
65	**Hypersaline community number 2 (Stromatolites of Hamelin Pool)**	Priority 4 (i)
	Hypersaline tidal stromatolite aragonite community formed by trapping and binding by a variety of cyanobacteria and eukaryotes.	
66	**Plant assemblages (spinifex dominated) of sand dune mesa topping the Kennedy Range National Park**	Priority 4 (i)
67	**Invertebrate assemblages of Edithana Pool**	Priority 4 (ii)
	High quality river pool on the Lyons River. High invertebrate diversity.	
	Threats: cattle and Tilapia	
68	**Springs of the Western Kennedy Ranges**	Priority 4 (ii)
	Spring in the Kennedy Range. Has rich representative invertebrate community.	
	Threats: feral goats and mining.	
69	**Invertebrate assemblages of Cattle Pool**	Priority 4 (ii)
	High quality river pool on the Lyons River adjacent to Mt Augustus National Park. High invertebrate diversity.	
	Threats: cattle and Tilapia	
70	**Invertebrate assemblages of Yinnetharra Cattle Pool**	Priority 4 (ii)
	Permanent freshwater pool on the middle Gascoyne.	
	Threats: cattle	
71	**Invertebrate assemblages of Mibbley pool**	Priority 4 (ii)
	Large relatively undisturbed freshwater pool on the upper Gascoyne River (therefore unusual). Until recently protected from stock by thick riparian vegetation. A track has been cleared to the pool which has allowed stock access.	
72	**Invertebrate assemblages of Erong Springs**	Priority 4 (ii)
	High aquatic invertebrate diversity site in the Gascoyne area.	
	Threats: stock and goats.	
73	**Invertebrate assemblages of Callytharra Spring, Wooramel River**	Priority 4 (ii)
	Permanent Spring on the Wooramel river. High aquatic invertebrate diversity	
	Threats: cattle.	
74	**Lake Macleod invertebrate assemblages**	Priority 4 (ii)
	Saline aquatic community with strong marine affinities with particularly rich copepod elements - is effectively a well developed, very rich birrida community with strong marine and terrestrial components with especially rich hypactacoid community. Distinctive but lacks threats.	
GOLDFIELDS		
1	**Koolyanobbing vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: Subject to mining	
2	**Die Hardy Range/Diemels vegetation complex (banded ironstone formation)**	Priority 1
	Threats: iron ore mining.	
3	**Mount Jackson Range vegetation complex (banded ironstone formation)**	Priority 1
	Threats: iron ore mining.	
4	**Mount Dimer vegetation complexes (banded ironstone formation).**	Priority 1
	Threats: mining	
5	**Windarling Ranges vegetation complex (banded ironstone formation)**	Priority 1
	Threats: mining	
6	**Booylgoo Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
7	**Bulga Downs/ Perinvale/Walling/vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
8	**Cashmere Downs vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
9	**Finnerty Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	

10	**Lake Giles vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
11	**Lake Mason vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
12	**Montague Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
13	**Lee Steere Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
14	**Violet Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
15	**Wiluna West vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: mining	
16	**Albion Downs calcrete groundwater assemblage type on Carey palaeodrainage on Albion Downs Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
17	**Banjawarn and Melrose (Lake Darlot) calcrete groundwater assemblage type on Carey palaeodrainage on Banjawarn and Melrose Stations**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
18	**Barwidgee calcrete groundwater assemblage type on Carey palaeodrainage on Barwidgee Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
19	**Black Range North calcrete groundwater assemblage type on Raeside palaeodrainage on Lake Mason Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
20	**Cunyu SBF and Cunyu Sweetwater calcrete groundwater assemblage types on Nabberu palaeodrainage on Cunyu Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
21	**Dandaraga calcrete groundwater assemblage type on Raeside palaeodrainage on Dandaraga Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
22	**Depot Springs calcrete groundwater assemblage type on Raeside palaeodrainage on Depot Springs Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
23	**Glenayle and Carnegie Downs calcrete groundwater assemblage type on Burnside palaeodrainage on Glenayle Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
24	**Hinkler Well calcrete groundwater assemblage type on Carey palaeodrainage on Lake Way Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
25	**Lake Way South calcrete groundwater assemblage type on Carey palaeodrainage on Lake Way Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
26	**Jundee Homestead calcrete groundwater assemblage type on Carnegie palaeodrainage on Jundee Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	

27	**Jundee South Hill calcrete groundwater assemblage type on Carnegie palaeodrainage on Jundee Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
28	**Kaluwiri calcrete groundwater assemblage type on Raeside palaeodrainage on Kaluwiri Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
29	**Lake Mason calcrete groundwater assemblage type on Raeside palaeodrainage on Lake Mason Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
30	**Lake Miranda east calcrete groundwater assemblage types on Carey palaeodrainage on Yakabindie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
31	**Lake Miranda west calcrete groundwater assemblage types on Carey palaeodrainage on Yakabindie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
32	**Lake Violet south and Lake Violet calcrete groundwater assemblage types on Carey palaeodrainage on Millbillillie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
33	**Laverton Downs calcrete groundwater assemblage type on Carey palaeodrainage on Laverton Downs Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
34	**Lorna Glen calcrete groundwater assemblage type on Carnegie palaeodrainage on Lorna Glen Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
35	**Melita calcrete groundwater assemblage type on Raeside palaeodrainage on Melita Station (Sons of Gwalia)**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
36	**Millbillillie: Bubble calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
37	**Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
38	**Nambi calcrete groundwater assemblage type on Carey palaeodrainage on Nambi Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
39	**Old Cunya calcrete groundwater assemblage type on Nabberu palaeodrainage on Cunyu Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
40	**Perrinvale (Pine Well) calcrete groundwater assemblage type on Raeside palaeodrainage on Perrinvale Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
41	**Pinnacles calcrete groundwater assemblage type on Raeside palaeodrainage on Pinnacles Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	

42	**Sturt Meadows calcrete groundwater assemblage type on Raeside palaeodrainage on Sturt Meadows Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
43	**Uramurdah Lake calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
44	**Wiluna BF calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
45	**Windidda calcrete groundwater assemblage type on Carnegie palaeodrainage on Windidda Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
46	**Yakabindie calcrete groundwater assemblage type on Carey palaeodrainage on Yakabindie Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
47	**Yandal calcrete groundwater assemblage type on Carey palaeodrainage on Yandal Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
48	**Yeelirrie calcrete groundwater assemblage type on Carey palaeodrainage on Yeelirrie Stration**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
49	**Yuinmery calcrete groundwater assemblage types on Raeside palaeodrainage on Yuinmery Station**	Priority 1
	Unique assemblages of invertebrates have been identified in the groundwater calcretes.	
	Threats: mining	
50	**Helena and Aurora Range vegetation complexes (banded ironstone formation)**	Priority 1
	Threats: iron ore mining.	
51	**Mount Manning Range vegetation complex (banded ironstone formation)**	Priority 1
	Threats: iron ore mining.	
52	**Banded Ironstone Hills with *Dryandra arborea***	Priority 1
	On Unallocated Crown Land in excellent condition north-west Menzies area.	
	Threats: mining	
53	**Yellow sandplain communities of the Great Victoria Desert**	Priority 3(ii)
	Very diverse mammalian and reptile fauna, distinctive plant communities.	
	Threats: mining	
54	**Yilgarn Hills vegetation complex**	Priority 3(iii)
	Threats: mining	
55	**Mount Belches *Acacia quadrimarginea* / *Ptilotus obovatus* banded ironstone community**	Priority 3(iii)
	On Randall Timber Reserve.	
	Threats: Has grazing coexistence with the reserve.	
56	**Duladgin Ridge vegetation complex**	Priority 3(iii)
57	**Mount Jumbo Range vegetation complex**	Priority 3(iii)
	Laverton area, northeast goldfields	
58	**Mount Linden Range banded ironstone ridge vegetation complex**	Priority 3(iii)

SOUTH WEST		
1	***Reedia spathacea - Empodisma gracillimum – Sporadanthus rivularis*** **dominated floodplains and paluslopes of the Blackwood Plateau** Diverse closed sedges and rushes to 1.5 m in height of *Reedia spathacea/Empodisma gracillimum/Sporadanthus rivularis* with open low shrubs to open scrub of *Taxandria linearifolia* .	Priority 1
2	**Granite community dominated by the shrubs *Calothamnus graniticus* subsp. *graniticus* , *Acacia cyclops, A. saligna, Hakea oleifolia, H. prostrata and Jacksonia furcellata* (Sugar Loaf Rock)** Shrubland (0.5-2 m) growing on shallow soils derived from granite gneiss on the Cowaramup and Gracetown (Willyabrup Exposed Rocky Slopes land unit) soil landscape systems. The dominant species include: *Allocasuarina humilis, Acacia cyclops, A. littorea, A. pulchella, A. rostellifera, Calothamnus graniticus, Darwinia citriodora, Corymbia calophylla, Daviesia horrida, D. preissii, Dryandra lindleyana, D. erinacea, Hakea prostrata, H. trifurcata, Spyridium globulosum, Pimelea ferruginea,* and *Xanthorrhoea preissi.*	Priority 1
3	***Corymbia calophylla, Melaleuca rhaphiophylla, Banksia littoralis, Eucalyptus rudis, Agonis flexuosa*** **low open forest with seasonal subsoil moisture of the Dunsborough area** *Corymbia calophylla* , *Agonis flexuosa, Banksia littoralis, Melaleuca rhaphiophylla* low open forest over *Viminea juncea, Jacksonia furcellata* tall open shrubland over *Xanthorrhoea preissii, Pericalymma elliptica shrubland* over *Hibbertia* spp, *Astroloma pallidum, Leucopogon australia* open low heath over *Hypolaena pubescens, Mesomelaena tetragona, Lepidosperma* spp. dense sedges over *Amphipogon* and *Thysanotus* spp. open herbs. The community occurs on sandy loam soils at the southern tip of the Swan Coastal Plain. Threats: urban development, weeds and recreation impacts, fire and changes in hydrology	Priority 1
4	**Tall closed sedgeland on shallow soils derived from granite gneiss on the Leeuwin Naturaliste Ridge ('Sedgelands of the Cape Leeuwin Spring')** Tall closed sedgeland of *Juncus krausii, Baumea juncea, and Schoenoplectus validus;* tall closed sedgeland of *Typha orientalis,* over *S. validus, Lepidosperma gladiatum* and *Muehlenbeckia adpressa;* low closed sedgeland of *Ficina nodosa and Baumea juncea* on shallow soils derived from granite gneiss on the Leeuwin Naturaliste Ridge.	Priority 1
5	***Eucalyptus cornuta, Agonis flexuosa*** **and *Eucalyptus decipiens* forest on deep yellow-brown siliceous sands over limestone ('Busselton Yate community')**	Priority 1
6	***Eucalyptus rudis, Corymbia calophylla, Agonis flexuosa*** **Closed Low Forest (near Busselton)** A low lying Spearwood Dune plant community associated with shallow sandy soils over Tamala limestone that in places is exposed at the surface. The plant community on these soils supports a unique mixture of wetland and upland flora. Typically low forest dominated by *Eucalyptus rudis, Eucalyptus calophylla, Agonis flexuosa* over a diverse understorey including *Hibbertia hypericoides, Logania vaginalis, Conospermum caeruleum, Agrostocrinum hirsutum* and *Lomandra micrantha.* Other associated species include *Eucalyptus decipiens* , *Melaleuca rhaphiophylla, Banksia littoralis, Hakea varia* and the sedge species *Baumea juncea* and *Gahnia trifida.*	Priority 1
7	***Eucalyptus patens, Corymbia calophylla, Agonis flexuosa*** **Closed Low Forest (near Busselton)** *Eucalyptus patens* on loamy brown sands over limestone. Species present include *Eucalyptus patens, Corymbia calophylla* and *Agonis flexuosa* over understorey species including *Bossiaea linophylla, Hibbertia hypericoides, Gastrolobium praemorsum, Leucopogon propinquus, Phyllanthus calycinus, Lomandra micrantha, Lepidosperma longitudinale, Mesomelaena tetragona, Cyathochaeta avenacea* and *Tetraria octandra.* The community is likely to have similarities to community type 1b 'Southern *Corymbia calophylla* woodlands on heavy soils'.	Priority 1
8	**Central Whicher Scarp Mountain Marri woodland (Whicher Scarp woodlands of grey/white sands community A1)** Located on Whicher Scarp mid slopes. The taxa that identify the group include: *Ricinocarpus* aff. *cyanescens, Hibbertia ferruginea, Platysace filiformis, Conospermum capitatum* subsp. *glabratum, Thysanotus arbuscular, Schoenus brevisetis, Phlebocarya filifolia, Leucopogon glabellus, Pimelea rosea* subsp. *rosea, Adenanthos obovatus, Stylidium carnosum* and *Gompholobium capitatum* . Note: This community should be cross-referenced with '*Eucalyptus haematoxylon - Eucalyptus marginata* woodlands on Whicher foothills ('community type 1a')', see below.	Priority 1
9	**West Whicher Scarp *Banksia attenuata* woodland (Swan Coastal Plain centred woodlands of grey/white sands community B2)** This community type occurs in grey sand in the West Whicher Scarp. It is similar to the open *Banksia attenuata* woodlands with Peppermint (*Agonis flexuosa*) from the grey sands of the West Whicher Scarp. The type is species poor. Taxa include: *Allocasuarina fraseriana, Banksia attenuata, Xylomellum occidentale, Bossiaea praetermissa, Calytrix flavescens, Gompholobium tomentosum, Hibbertia hypericoides, Hovea stricta, Hypocalymma robustum, Kunzea rostrata, Petrophile linearis* and a suite of grasses, herbs and sedges.	Priority 1

10	**Central Whicher Scarp Jarrah woodland (Whicher Scarp woodlands of coloured sands and laterites community C1)**	Priority 1
	Occurs on coloured sands on moderate to gentle slopes of the Central Whicher Scarp. The community has strong representation of a less common group of southern taxa including: *Podocarpus drouyianus, Loxocarya cinerea, Allocasuarina fraseriana, Drosera stolonifera, Amperea ericoides, Thysanotus triandrus, Cyathochaeta equitans, Hibbertia quadricolor, Comesperma calymega, Lepidosperma pubisquameum, Conospermum paniculatum, Acacia preissiana* and *Hybanthus debissimus* .	
	Note: This community should be cross-referenced with '*Eucalyptus haematoxylon - Eucalyptus marginata* woodlands on Whicher foothills ('community type 1a')', see below.	
11	**Whicher Scarp Jarrah woodland of deep coloured sands (Whicher Scarp woodlands of coloured sands and laterites community C2)**	Priority 1
	Community is found scattered through the Central and North Whicher Scarp on midslopes on deep, generally coloured sands rarely associated with laterites. Community has a strongest representation of common sand taxa especially *Hypolaena exsulca, Dasypogon bromeliifolius, Stirlingia latifolia, Petrophile linearis, Melaleuca thymoides* and *Adenanthos meisneri* .	
	Note: This community should be cross-referenced with '*Eucalyptus haematoxylon - Eucalyptus marginata* woodlands on Whicher foothills ('community type 1a')', see below.	
12	**Dardanup Jarrah and Mountain Marri woodland on laterite (Whicher Scarp woodlands of coloured sands and laterites community C5)**	Priority 1
	Community located on unusual surface of quartzite and laterite in Dardanup forest which is an area where the Whicher Scarp, Blackwood Plateau and Darling Scarp interface. It is notable in the presence of uncommonly encountered laterite taxa including: *Lomandra* sp. Dardanup, *Lomandra spartea, Olax benthamiana, Andersonia heterophylla, Hemigenia incana, Acacia varia* var. *varia, Daviesia angulata, Pimelea preissii,* and also *Lomandra brittanii, Xanthorrhoea acanthostachya, Dryandra armata* var. *armata* , *Hakea stenocarpa, Stachystemon vermicularis, Lambertia multiflora* var *darlingensis, Petrophile striata* and *Pimelea sulphurea.*	
	Note: This community should be cross-referenced with '*Eucalyptus haematoxylon - Eucalyptus marginata* woodlands on Whicher foothills ('community type 1a')', see below.	
13	**Sabina River Jarrah and Marri woodland (Whicher Scarp community F1)**	Priority 1
	Community in Sabina River alluvial fan where the Sabina River meets the Swan Coastal Plain. It is characterised by a suite of wetland taxa of restricted occurrence in the Whicher Scarp: *Mirbelia dilatata, Lomandra pauciflora, Tremandra diffusa, Tremandra stelligera, Trymalium floribundum* subsp. *trifidum* and *Clematis aristata* var. *occidentalis* . Other significant taxa in the community are: *Hovea elliptica, Leucopogon verticillatus* , and *Darwinia citriodora* .	
14	**Shrublands of near permanent wetlands in creeklines of the Whicher Scarp (Whicher Scarp community G2)**	Priority 1
	Community is species poor and included the following taxa: *Astartea scoparia, Homalospermum firmum, Taxandria fragrans* MS, **Anthoxanthum odoratum, Baumea rubingosa, Cyathochaeta teretifolia, Isolepis cernua, Taraxis grossa* .	
15	**Swan Coastal Plain Paluslope Wetlands**	Priority 1
	These wetlands are very wet all year round and are associated with areas of groundwater seepage from the sandy low hills at the base of the Whicher Scarp. At times these wetlands are contiguous with areas of Pinjarra Plain wetlands, and the wetlands of the two landforms merge. Combinations of the following species are typically found in the type: *Melaleuca preissiana, Taxandria linearifolia, Taxandria fragrans, Melaleuca incana,* and *Cyathochaeta teretifolia* . Other species include: *Eucalyptus patens, Homalospermum firmum, Gahnia decomposita, Callistachys lanceolata, Hakea linearis, Melanostachya ustulata, Evandra aristata, Beaufortia sparsa, Calistemon glaucus* and *Pultenaea pinifolia* .	
16	**Relictual White Mangrove Community (Leschenault Inlet)**	Priority 1
	May not be considered a separate community type as is possibly a geographic outlier.	
17	***Melaleuca lanceolata* forests, Leeuwin Naturaliste Ridge**	Priority 2
	Low Closed Forest to Closed Forest of *Melaleuca lanceolata* ("moonah") occurring near the coastline of the Leeuwin-Naturaliste Ridge adjacent to limestone cliffs and down steeply sloping rock slopes on dark-grey, brown or, less commonly, pale-grey sands, often with outcropping limestone. The Moonah varies from 2 to 15 metres, reflecting depth of soil and wind pruning. Typical understorey shrubs are *Tetragonia implexicoma, Rhagodia baccata, Leucopogon propinquus* , and *Suaeda australis* .	
18	**Blackwood Alluvial Flats**	Priority 2
	Woodlands and shrublands of the alluvial soils of the upper Blackwood River (Condinup and Darkan 5f soil-landscape sub-systems). Vegetation associations identified to date: Wet shrublands on alluvial clay flats, Jarrah-Marri woodlands on alluvial grey-brown loams, Wandoo woodlands on alluvial grey-brown clay-loams (includes vernal pools), Flooded Gum-Wandoo woodland on alluvial grey clays (includes vernal pools), Wandoo woodlands on grey sandy loams	

19	**Low shrublands on acidic grey-brown sands of the Gracetown soil-landscape system**	Priority 2
	A low shrubland or heath occurring on grey brown sand with a bleached surface derived from granite gneiss near the west coast of the Leeuwin-Naturaliste Ridge. Dominant or characteristic shrub species include; *Calothamnus sanguineus, Darwinia citriodora, Hakea prostrata, Hakea trifurcata, Jacksonia horrida, Kunzea ciliata, Pimelea ferruginea, Pimelea rosea, Spyridium globulosum, Verticordia plumosa* var. *plumosa, Xanthorrhoea brunonis* . Common herbs, grasses and sedges include; *Asteridea pulverulenta, Austrodanthonia setacea, Austrostipa compressa, Brachyscome iberidifolia, Lepidosperma squamatum, Platysace haplosciadia, Trichocline spathulata* and *Velleia trinervis* .	
20	***Southern Swan Coastal Plain *Eucalyptus gomphocephala* - *Agonis flexuosa* woodlands (type 25)**	Priority 3(iii)
	Woodlands of *Eucalyptus gomphocephala* - *Agonis flexuosa* south of Woodman Point. Recorded from the Karrakatta, Cottesloe and Vasse units. Dominants other than tuart were occasionally recorded, including *Corymbia calophylla* at Paganoni block and *Eucalyptus decipiens* at Kemerton. Tuart formed the overstorey nearby however.	
21	**Quindalup *Eucalyptus gomphocephala* and / or *Agonis flexuosa* woodlands ('community type 30b')**	Priority 3(i)
	This community is dominated by either Tuart or *Agonis flexuosa* . The presence of *Hibbertia cuneiformis, Geranium retrorsum* and *Dichondra repens* differentiate this group from other Quindalup community types. The type is found from the Leschenault Peninsular south to Busselton.	
22	***Eucalyptus haematoxylon* - *Eucalyptus marginata* woodlands on Whicher foothills ('community type 1a')**	Priority 3(i)
	Community occurs along the northern edge of State Forest along the base of the Whicher Range and is composed of *Eucalyptus haematoxylon – Corymbia calophylla* - *Eucalyptus marginata* forests and woodlands. Taxa virtually restricted to the type include *Acacia varia* subsp. *varia* , *Agonis grandiflora* and *Xanthosia pusilla* .	
23	***Low lying *Banksia attenuata* woodlands or shrublands ('community type 21c')**	Priority 3(i)
	This type occurs sporadically between Gingin and Bunbury, and is largely restricted to the Bassendean system. The type tends to occupy lower lying wetter sites and is variously dominated by *Melaleuca preissiana, Banksia attenuata* , *B. menziesii, Regelia ciliata, Eucalyptus marginata* or *Corymbia calophylla* . Structurally, this community type may be either a woodland or occasionally shrubland.	
24	**Southern *Banksia attenuata* woodlands ('community type 21b')**	Priority 3(i)
	This community is restricted to sand sheets at the base of the Whicher Scarp, the sand sheets on elevated ridges or the sand plain south of Bunbury. Structurally, this community type is normally *Banksia attenuata* or *Eucalyptus marginata – B. attenuata* woodlands. Common taxa include *Acacia extensa, Jacksonia* sp. Busselton, *Laxmannia sessiliflora, Lysinema ciliatum* and *Johnsonia acaulis* .	
	SWAN	
1	*** Pools of the Avon and Dale Rivers**	Priority 1
	Deep pools and natural braided sections of the fresh to brackish Avon and Dale Rivers.	
2	**Fairbridge Ironstone community**	Priority 1
	(Cemetery – Fairbridge Farm).	
3	**Mount Saddleback heath communities**	Priority 1
4	***Casuarina obesa* association**	Priority 1
	Thomas Rd to Serpentine River, Swan Coastal Plain. No detailed information to assess if distinct community.	
5	**Elongate fluviatile delta system**	Priority 1
	Peel Harvey system, the site appears to contain common vegetation types on an unusual substrate, may not meet the criteria for TECs.	
6	***Claypans with mid dense shrublands of Melaleuca lateritia over herbs** (note: community listed as critically endangered under the federal Environment Protection and Biodiversity Conservation Act 1999)	Priority 1
	Claypans (predominantly basins) usually dominated by a shrubland of *Melaleuca lateritia* occurring both on the coastal plain and the adjacent plateau. These claypans are characterized by aquatic (*Hydrocotyle lemnoides* – Priority 4) and amphibious taxa (e.g. *Glossostigma diandrum* , *Villarsia capitata* and *Eleocharis keigheryi* - DRF).	
7	**Brackish microbial community number 1 (Lake Walyungup)**	Priority 1
	Microbial community formed in Lake Walyungup, Rockingham. Data required about status and composition.	
	Threats: altered water levels and quality, damage from illegal access to lake bed.	
8	**Hypersaline microbial community 1**	Priority 2
	Extant coastal hypersaline lakes microbialite community formed by *Apanothecae halophitica* , *Oscillatoria* sp./ *Spirulina* sp., *Botrycoccus* and diatoms (Government House Lake, Rottnest).	

9	**Wandoo woodland over dense low sedges of *Mesomelaena preisii* on clay flats**	Priority 2
	Wandoo woodland on clay flats in valleys over dense low sedges of *Mesomelaena preisii*.	
10	**Banksia woodland of the Gingin area restricted to soils dominated by yellow to orange sands**	Priority 2
	Species-rich Banksia woodlands on deep yellow-red sands that appear restricted to the western Dandaragan Plateau. The vegetation is described as scattered *Eucalyptus todtiana* and *Eucalyptus calophylla* over *Banksia menziesii* and *Banksia attenuata* low open woodland over *Jacksonia sternbergiana* and *Adenanthos cygnorum* high open shrubland over *Allocasuarina humilis* and *Chamelaucium lullfitzii* (DRF) open shrubland over *Eremaea pauciflora* and *Astroloma xerophyllum* low shrubland over *Mesomelaena pseudostygia* open sedgeland.	
11	**Living microbial mats in hypersaline ponds**	Priority 2
	Extant hypersaline pond stromatolitic 'Conophyton' like unlithified communities formed with little sediment incorporation by (?) *Phormidium hypersalinum* (Pamelup Pond, Lake Preston, Yalgorup).	
12	**Wooded wetlands that support colonial waterbird nesting areas**	Priority 2
	Chandala, Booragoon Lake, unnamed wetland near Pinjarra, McCarleys Swamp.	
	This type differs from the listed 'Perched wetlands of the Wheatbelt region with extensive stands of *Casuarina obesa* and *Melaleuca strobophylla'* ('Toolibin-type' wetlands) in that the Wheatbelt type is Casuarina, rather than Melaleuca dominated. Also, Toolobin Lake type is now brackish-saline (formerly fresh-brackish), whereas this type are currently fresh-brackish.	
13	**Litter Dependent Invertebrate Community of the northern Jarrah Forest**	Priority 2
	Chandler Block, Northern Jarrah Forest, insufficient evidence that this is a discrete community type.	
14	***Banksia ilicifolia* woodlands, southern Swan Coastal Plain ('community type 22')**	Priority 2
	Low lying sites generally consisting of *Banksia ilicifolia – B. attenuata* woodlands, but *Melaleuca preissiana* woodlands and scrubs are also recorded. Occurs on Bassendean and Spearwood systems in the central Swan Coastal Plain north of Rockingham. Typically has very open understorey, and sites are likely to be seasonally waterlogged.	
15	**Coastal shrublands on shallow sands, southern Swan Coastal Plain ('community type 29a')**	Priority 3(ii)
	Mostly heaths on shallow sands over limestone close to the coast. No single dominant but important species include *Spyridium globulosum, Rhagodia baccata* , and *Olearia axillaris* .	
16	**Granite communities of the northern Jarrah Forest**	Priority 3(i)
	Jarrahdale area - Monadnocks, Blue Rock; insufficient information to distinguish discrete community type/s.	
17	**Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands ('community type 23b')**	Priority 3(i)
	These woodlands occur in the Bassendean system, from Melaleuca Park to Gingin. Occurs in reasonably extensive Banksia woodlands north of Perth.	
18	***Southern Swan Coastal Plain *Eucalyptus gomphocephala - Agonis flexuosa* woodlands (type 25)**	Priority 3(i)
	Woodlands of *Eucalyptus gomphocephala - Agonis flexuosa* south of Woodman Point. Recorded from the Karrakatta, Cottesloe and Vasse units. Dominants other than tuart were occasionally recorded, including *Corymbia calophylla* at Paganoni block and *Eucalyptus decipiens* at Kemerton. Tuart formed the overstorey nearby however.	
19	***Low lying *Banksia attenuata* woodlands or shrublands ('community type 21c')**	Priority 3(i)
	This type occurs sporadically between Gingin and Bunbury, and is largely restricted to the Bassendean system. The type tends to occupy lower lying wetter sites and is variously dominated by *Melaleuca preissiana, Banksia attenuata , B. menziesii, Regelia ciliata, Eucalyptus marginata* or *Corymbia calophylla* . Structurally, this community type may be either a woodland or occasionally shrubland.	
20	**Northern Spearwood shrublands and woodlands ('community type 24')**	Priority 3(i)
	Heaths with scattered *Eucalyptus gomphocephala* occurring on deeper soils north from Woodman Point. Most sites occur on the Cottesloe unit of the Spearwood system. The heathlands in this group typically include *Dryandra sessilis, Calothamnus quadrifidus* , and *Schoenus grandiflorus* .	
21	**Acacia shrublands on taller dunes, southern Swan Coastal Plain ('community type 29b')**	Priority 3(i)
	Community is dominated by Acacia shrublands or mixed heaths on the larger dunes. This community stretches from Seabird to south of Mandurah. No consistent dominant but species such as *Acacia rostellifera, Acacia lasiocarpa,* and *Melaleuca acerosa* were important.	
22	**Central Northern Darling Scarp Granite Shrubland Community**	Priority 4 (i)
	Shrublands and heath on deeper loams and red earths on fragmented granite/quartzite. Heath species typically consist of the taller shrubs *Xanthorrhoea acanthostachya* and *Allocasuarina humilis* over smaller proteaceous and myrtaceous shrubs, namely *Melaleuca* aff. *scabra , Baeckea camphorosmae* and to a lesser extent, the proteaceous shrubs *Dryandra armata, Hakea incrassata and Hakea undulata* . Located in central region of the Northern Darling Scarp near Perth.	

WARREN		
1	***Reedia spathacea - Empodisma gracillimum - Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region**	Priority 1
	Sedges/ rushes to about 1.5m in height of *Reedia spathacea/Empodisma gracillimum/Schoenus multiglumis* with *Homalospermum firmum* low open shrubs to scrub.	
2	**Relictual peat community**	Priority 1
	Lake Surprise.	
3	**Southwest Coastal Grassland**	Priority 1
	Southwest coastal grassland dominated by *Austrostipa flavescens, Poa porphyroclados* and *Desmocladus flexuosus.*	
4	**Dense heath B of *Spyridium glosulosum, Banksia occidentalis, Olearia axillaris, Melaleuca pauciflora, Pericalymma spongiocaule* and *Jacksonia horrida* with tall open sedges of *Ficinia nodosa***	Priority 1
	Typical species may include *Anarthria prolifera, Ficinia nodosa, Baumea juncea, Hibbertia stellaris, Patersonia occidentalis, Cassytha racemosa, Melaleuca pauciflora, Melaleuca* sp., *Pericalymma spongiocaule, Banksia occidentalis, Hakea varia, Spyridium globulosum, Dodonaea ceratocarpa.* Found at Black point, D'Entrecasteaux National Park	
	Threats: Uncontrolled vehicle access, trampling, grazing, altered hydrology, *Phytophthora* and acid sulphate soils.	
5	**Low forest B of *Melaleuca cuticularis* with *Banksia occidentalis***	Priority 1
	Typical species include *Melaleuca cuticularis, Banksia occidentalis, Acacia saligna, Rhadinothamnus anceps, Cassytha racemosa, Spyridium globulosum, Olearia axillaris, Olax phyllanthii, Agonis flexuosa, Xanthorrhoea preissii, Muehlenbeckia adpressa.* Found at Black point, D'Entrecasteaux National Park	
	Threats: Uncontrolled vehicle access, trampling, grazing, altered hydrology, *Phytophthora* and acid sulphate soils.	
6	**Sphagnum communities of the Tingle Forest**	Priority 2
	Only 3 known occurrences - Walpole area.	
7	**Basalt association of the Warren Region**	Priority 2
	Black Point - near Augusta.	
	Dwarf Scrub D *Leucophyta brownii* , *Sarcocornia quinquefolia* and *Olearia axillaris* with Open Low Sedges of *Juncus pauciflorus* and Herbs of *Sarcocornia quinquefolia* , *Isolepis* sp., *Samolus repens* and Very Open Low Grass of *Sporobolus virginicus* . Bunbury Basalt outcrops, flats over Bunbury Basalt with reddish brown sandy clay loam basaltic soils and basaltic saprolite outcrops with light yellowish brown clays.	
	Threats: Uncontrolled vehicle access, trampling, grazing, altered hydrology, *Phytophthora* and acid sulphate soils.	
8	**Saprolite association of the Warren Region**	Priority 2
	Walpole Inlet. 'Palusmont wetland communities'.	
9	**Flat wetlands Rocky Gully to Denmark**	Priority 2
	Threats: dieback and fire.	
10	**Southern Granite community (Muirillup Rock, Northcliffe)**	Priority 2
	Subset of wheatbelt granites; insufficient information to distinguish discrete community type/s.	
11	**Aquatic invertebrate communities of peat swamps**	Priority 2
12	**Microbial tufa community (Black Point type)**	Priority 3 (i)
	A comparison of the species composition of the microbial tufa at Black Point with the TEC 'Rimstone pools and caves structures formed by microbial activity on marine shorelines', at Augusta needs to be completed to determine if the communities should be considered as separate types.	
	Threats: Recreational activity has the potential to impact on some of the occurrences through physical disturbance and altered hydrology.	
13	**Epiphytic Cryptogams of the karri forest**	Priority 3 (iii)
	Cryptogams associated with *Trymalium floribundum* and *Chorilaena quercifolia* in the karri forests of south-west WA. Comprises liverworts, mosses and lichens found on the bark of mature (plants greater than 15 years old and prior to senescence at about age 50) *Trymalium floribundum* and *Chorilaena quercifolia* in the karri forest of south-west Western Australia.	

WHEATBELT		
1	**Highclere Hills (Mayfield) vegetation complex (banded ironstone formation)**	Priority 1
	Threats: iron ore mining.	
2	**Red Morrel Woodland of the Wheatbelt**	Priority 1
	Tall open woodlands of *Eucalyptus longicornis* (red morrell) found in the Wheatbelt on lateritic, ironstone or granitic soil types. Sometimes found with *Eucalyptus salmonophloia* (Salmon Gum), or *E. loxophleba* (York Gum) woodlands and has very little understorey. It is also found directly above lake systems in the central and eastern Wheatbelt. The landscape unit in which it is found is valley floors, usually adjacent to saline areas.	
3	*** Pools of the Avon and Dale Rivers**	Priority 1
	Deep pools and natural braided sections of the fresh to brackish Avon and Dale Rivers.	
4	**Canegrass perched clay wetlands of the wheatbelt dominated by *Eragrostis australasica* and *Melaleuca strobophylla* across the lake floor**	Priority 1
5	**Mottlecah dominated heathland on deep white sands**	Priority 1
	Wheatbelt Mottlecah *(Eucalyptus macrocarpa* subsp. *macrocarpa)* dominated heathland on deep white sands. *Eucalyptus macrocarpa* over proteaceous sandplain community.	
6	**Natural organic saline seeps of the Avon Botanical District**	Priority 1
	The known occurrence of this community is characterised by vegetation in a series of bands from the upland to the saline seep. 1) Dunes and sandplain, 2) Saline seep and 3) Adjacent flats and flow lines.	
7	**Dense Melaleuca thickets with emergent mallee *Eucalyptus erythronema* var. *marginata* and *Eucalyptus transcontinentalis* of the Wheatbelt Region**	Priority 1
8	**Tamma-Dryandra-Eremaea shrubland**	Priority 1
	Tamma-Dryandra-Eremaea shrubland on cream sands of the Ulva Landform Unit. *Acacia lasiocalyx* and *Allocasuarina campestris* over *Eremaea pauciflora* , *Dryandra armata* , *Hakea aculeata* and *Dryandra erythrocephala* open heath over *Neurachne alopecuroidea* very open grassland over cream sands of the Ulva Landform Unit.	
9	***Banksia prionotes* and *Xylomelum angustifolium* low woodlands on transported yellow sand**	Priority 1
	Banksia prionotes and *Xylomelum angustifolium* Low Woodlands on large yellow sands dunes (formed from sheets of transported sand in the valleys) on the Ulva Landform Unit. The community has a species rich understorey of *Grevillea eriostachya, Melaleuca leptospermoides, Verticordia roei, Calytrix leschenaultii, Dampiera* spp., *Baeckea preissiana* and *Borya constricta.*	
10	**Salt Flats Plant Assemblages of the Mortlock River (East Branch)**	Priority 1
	The habitat comprises braided channels (up to 2 km wide), flats, wash-lines and sandy rises (up to 2m high) stretching 39 km along the Mortlock River (East) from Meckering eastwards to 8 km west of Tammin. A mosaic of plant communities assorted by elevation occurs on the river flats. The area represents the most extensive braided saline drainage line in this part of the SW agricultural zone. The plant community comprises mixed shrubs (*Scholtzia capitata* , *Melaleuca* aff. *uncinata*) over species rich herbs on sandy rises, with *Melaleuca thyoides* on margins, dwarf scrub and species rich herbs on washlines and saline wetlands.	
11	**Brown mallet *Eucalyptus astringens* communities in the western Wheatbelt on alluvial flats (previously 'Beaufort River Flats')**	Priority 1
	Near York and on the Arthur River on grey clays the understorey is dominated by *Melaleuca viminea* over sedges (*Gahnia trifida*) and bunch grasses. At Kojunup and near Tambellup on brown clays sparse shrubs and succulent shrubs (*Disphyma crassifolium*) dominate the understorey.	
12	**Yate (*Eucalyptus occidentalis*) dominated alluvial claypans of the Jingalup Soil System**	Priority 2
13	**Gypsum Dunes (Lake Chinocup)**	Priority 2
	Eucalyptus aff. *incrassata* mallee over low scrub on gypsum dunes.	
14	**Wheatbelt *Allocasuarina huegeliana* over *Pteridium esculentum* fernland community**	Priority 2
	Tall emergent *Eucalyptus salmonophloia* over *Allocasuarina huegeliana* tall closed forest over *Acacia acuminata* mid-high isolated trees over *Alyxia buxifolia* tall sparse shrubland over *Pteridium esculentum* very tall closed fernland over various sparse forbland. Occurs in a drainage line near the base of a granite inselberg.	
15	***Claypans with mid dense shrublands of Melaleuca lateritia over herbs** (note: community listed as critically endangered under the federal Environment Protection and Biodiversity Conservation Act 1999)	Priority 2
	Claypans (predominantly basins) usually dominated by a shrubland of *Melaleuca lateritia* occurring both on the coastal plain and the adjacent plateau. These claypans are characterized by aquatic (*Hydrocotyle lemnoides* – Priority 4) and amphibious taxa (e.g. *Glossostigma diandrum* , *Villarsia capitata* and *Eleocharis keigheryi* - DRF).	
16	***Allocasuarina huegeliana* and *Lepidosperma tuberculatum* growing on the south-western side of granite outcrops adjacent to laterite on the eastern slopes of the Darling Scarp**	Priority 2
17	***Ironcap Hills vegetation complexes** (Mt Holland, Middle, North and South Ironcap Hills, Digger Rock and Hatter Hill)	Priority 3(iii)
	Threats: mining	

18	**Parker Range vegetation complexes**	Priority 3(iii)
	Hakea pendula Tall Shrubland is of particular significance. *Eucalyptus sheathiana* with *E. transcontinentalis* and/or *E. eremophila* woodland on sandy soils at the base of ridges and low rises; *E. longicornis* with *E. corrugata* and *E. salubris* or *E. myriadena* woodland on broad flats; *E. salmonophloia* and *E. salubris* woodland on broad flats; *Allocasuarina acutivalvis* and *A. corniculata* on deeper sandy soils of lateritic ridges; *E. capillosa* subsp. *polyclada* and/or *E. loxophleba* over *Hakea pendens* thicket on skeletal soils on ridges (laterites, breakaways and massive gossanous caps); and *Callitris glaucophylla* low open woodland on massive greenstone ridges.	
	Threats: exploration and mining	
19	***Granite outcrop pools with endemic aquatic fauna**	Priority 3(i)
	Freshwater pools formed on granite outcrops that may persist for several months and house a variety of aquatic invertebrates, some of which are endemic to south-west WA. Some examples include cladocerans, ostracods, copepods, rotifers, oligochaetes and molluscs.	
20	**Eucalypt woodlands of the Western Australian Wheatbelt**	Priority 3(iii)
	Eucalypt-dominated woodlands in the Western Australian Wheatbelt region as defined by the IBRA Avon Wheatbelt 1 and 2 and Western Mallee subregions with the specific exceptions of: woodlands and forests dominated by Jarrah (*E. marginata*) or Marri (*Corymbia calophylla*) where they occur without York Gum present; and non-woodland communities dominated by eucalypts, specifically those dominated by eucalypts with a mallee growth form. Community is defined primarily by its structure as a woodland. The presence in the canopy layer of eucalypt trees - most commonly salmon gum (*Eucalyptus salmonophloia*), York gum (*Eucalyptus loxophleba*), red morrel (*Eucalyptus longicornis*) or gimlet (*Eucalyptus salubris*) defines the Wheatbelt woodlands. Several of the other emergent eucalypt species which may be present as a defining species (e.g. Kondinin blackbutt (*E. kondinensis*), *E. myriadena* , salt river gum (*E. sargentii*), silver mallet (*E. ornata*) and mallet (*E. singularis*) are found only in the Western Australian Wheatbelt.	
	Threats: altered hydrology, grazing, altered fire regimes, vegetation clearing, exotic species, soil cultivation and fertilization	
21	**Plant assemblages of the Wongan Hills System**	Priority 4(i)
	Mallee over *Petrophile shuttleworthiana/Allocasuarina campestris* thicket on shallow gravely soils over ironstone on summit and slopes; Shrub mallee on slopes of lateritic hills; Mallee over *Allocasuarina campestris* thicket on the slopes of the laterite plateaus; Mallee over Melaleuca thicket on red brown loam over gravel on slopes below the plateau; Mallee over *Melaleuca coronicarpa* heath on shallow red soil on scarp slopes; *A. campestris/Calothamnus asper* thicket over red-brown clay/ironstone/greenstone on scree slopes; and in lower areas: *Eucalyptus longicornis/ E. salubris* woodland, *E. salmonophloia* and *E. loxophleba* woodlands; *Acacia acuminata* low forest; *E. ebbanoensis* mallee over scrub; and open mallee of *E. drummondii.*	
	SOUTH COAST	
1	**Stromatolite-like microbialite community of a Coastal Hypersaline Lake (Pink Lake)**	Priority 1
	Microbial, invertebrate and plant assemblages of natural saline seeps. Well-laminated stromatolites consisting of alternations of egg-shell-like layers of inorganic aragonite precipitate and calcified microbial layers dominated by coccoid cyanobacteria and photosynthetic bacteria. These structures probably record seasonal alternations of the growth of a benthic microbial community and aragonite precipitation.	
2	**Ridge Road Quartzite community**	Priority 1
	Open Jarrah forest and woodland developed on young exposed quartzite with an understorey dominated by *Taxandria parviceps* on the western interface of the Yilgarn craton and the Albany-Frazer orogen.	
3	***Allocasuarina globosa* assemblages on greenstone rock (Esperance District)**	Priority 1
	Assemblage only known from near Norseman and in the Bremer Range (see below).	
	Threats: mining and exploration	
4	**Bremer Range vegetation complexes**	Priority 1
	Mt Day, Round Top Hill, Honman Ridge.	
	Eucalyptus rhomboidea ms and *E. eremophila* woodland on the side slopes of low ridges; *E. flocktoniae* woodland (with *E. salubris* , *E. salmonophloia* , *E. dundasii* and *E. tenuis*) on broad flat ridges and side slopes; *E. flocktoniae* and/or *E. longicornis* woodland on saline soils on ridges and flats adjacent to large salt lake systems; *E. longicornis* and/or *E. salmonophloia* or, *E. georgei* subsp *georgei* or, *E. dundasii* woodland, on low areas; *E. livida* woodland on lateritic tops or Allocasuarina thickets on greenstone ridges of lateritic breakaways; *Acacia duriuscula* , *Allocasuarina globosa* , *E. georgei* subsp. *georgei* and *E. oleosa* thickets on greenstone ridges with skeletal soils. Proposed Nature Reserve.	
	Threats: exploration and mining	

5	**Fraser Range vegetation complex**	Priority 1
	Plant assemblages of the Fraser Range Vegetation Complex: *Allocasuarina huegeliana* and *Pittosporum phylliraeoides* open woodland over *Beyeria lechenaultia* and *Dodonaea microzyga* Scrub and *Aristida contorta* bunch grasses (granite complex), on the slopes and summits of hills; *Acacia acuminata* Tall Shrubland dominated by *Melaleuca uncinata* and *Triodia scariosa* on uplands with shallow loamy sands; *Eucalyptus* aff. *uncinata* (KRN 7854) over *Senna artemisioides* subsp. *helmsii* , *Cryptandra miliaris* , *Dodonaea boroniifolia* , *D. stenozyga* and *Triodia scariosa* (*Eucalyptus effusa* Mallee) on colluvial flats with loamy clay sands, and; *E. oleosa* , *E. transcontinentalis* , *E. flocktoniae* Woodland on flats.	
6	**Plant assemblages of the Southern Hills Vegetation Complex**	Priority 1
	Complex of woodland *(E. oleosa, E. transcontinentalis, E. flocktoniae)* on flats with open stony ridges carrying mainly mallee and spinifex *(Eucalyptus effusa* Mallee: *Eucalyptus* aff. *uncinata* (KRN 7854) *over Cassia helmsii, Cryptandra miliaris, Dodonaea boroniifolia, D. stenozyga* and *Triodia scariosa).* Includes patches of grassland, wattle thicket and mallee.	
7	**Green Range granite hill heath and woodland community**	Priority 1
	Heath and woodland dominated by *Acacia heteroclita, Anthocercis viscosa* , *Thryptomene saxicola, Darwinia citriodora, Prostanthera verticillata, Platysace compressa, Gastrolobium bilobum, Hakea oleifolia, Leucopogon verticillaris, Agonis flexuosa, Eucalyptus cornuta* , and *Acacia drummondii* ssp. *elegans* on red clay-loam over granite.	
8	**Wet ironstone heath community (Albany District)**	Priority 1
	The habitat for the community is winter-wet ironstone in valley floors. The heath community is dominated by *Kunzea recurva, K. preissiana* , *K. micrantha, Hakea lasiocarpha, H. tuberculata, H. oldfieldii, H. cucullata, H. sulcata, Petrophile squamata, Dryandra tenuifolia* ssp. *tenuifolia, Adenanthos apiculatus, Melaleuca suberosa, M. violacea, Gastrolobium spinosum* . North Porongurup.	
9	**Porongurup Range Karri Forest**	Priority 1
	Occurs on granite, red clay-loam on the mid-upper slopes of the Porongurup Range. Dominants include *Eucalyptus diversicolor, Corymbia calophylla, Trymalium floribundum, Hydrocotyle ?hirta* , *Tetrarrhena laevis, Clematis pubescens, Lepidosperma effusum* and *Pteridium esculentum* . Other associated species include; *Apium prostratum* subsp. *phillipii* (DRF), *Ranunculus colonorum, Adiantum aethiopicum, Asplenium flabellifolium, A. aethiopicum* (P4), *Veronica plebeia, Poa porphyroclados* and *Oxalis corniculata* .	
10	**Cheynes 1 Tree Mallee**	Priority 1
	Eucalyptus acies, E. lehmanii, E. goniantha Tree Mallee Tall Open Shrubland and Open Sedgeland on loam on steep slopes of spongelite breakaway. Common shrub species include *Gastrolobium bilobum, Rhadinothamnus rudis* , *Melaleuca blaeriifolia, Hakea elliptica, Spyridium majoranifolium* and *Agonis theiformis* . Common sedges include *Desmocladus flexuosus* and *Tetraria capillaris* . Priority taxa other than *E. acies* (P4) and *E. goniantha* (P4) include *Dryandra serra* (P4, at the eastern limit of its range) and *Calothamnus robustus* (P3).	
11	**Cheynes 2 Open Tree Mallee**	Priority 1
	Eucalyptus acies (P4), *E. doratoxylon* Tree Mallee over Mixed Tall Open Shrubland, Open Shrubland and Open Sedgeland on loam on gentle to moderate slopes and crests of spongelite outcropping. Common tall shrub species include *Allocasuarina trichodon, Hakea cucullata* and *H. lasiantha* ; however the tall shrub stratum may be absent. Common shrubs include *Calothamnus robustus* (P3), *Beaufortia empetrifolia, Dryandra mucronulata, Melaleuca striata* and *Taxandria spathulata* . Common sedges include *Mesomelaena stygia, M. tetragona, Cyathochaeta avenacea, Anarthria scabra* and *Chordifex leucoblepharus* .	
12	***Ironcap Hills vegetation complexes** (Mt Holland, Middle, North and South Ironcap Hills, Digger Rock and Hatter Hill)	Priority 3(iii)
	Threats: mining	
13	**Heath on Komatiite of the Raventhorpe area**	Priority 3(iii)
	Dense heath on alkaline red clay over komatiite (ultra-mafic rock) and associated carbonates. Note: very open tree mallee over heath B in Hale Bopp occurrence. Dominant species: *Beyeria* sp. Bandalup, *Acacia ophiolithica, Hakea verrucosa, Grevillea fastigiata, Melaleuca* sp. Gorse, *Allocasuarina* sp. Bandalup, *Verticordia oxylepis, Grevillea oligantha, Hybanthus floribundus, Pomaderris brevifolia* ssp. *brevifolia, Pultenaea wudjariensis, Melaleuca pomphostoma, Nematolepis phebalioides, Philotheca gardneri* Bandalup form, *Gyrostemon* sp. Ravensthorpe, *Calothamnus quadrifidus, Calytrix tetragona, Halgania anagalloides, Coleanthera myrtoides* . *Beyeria* sp., *Pultenaea wudjariensis, Grevillea fastigiata* and *Gyrostemon* sp. Ravensthorpe are narrow range endemics.	

14	***Melaleuca* sp. Kundip Heath**	Priority 1
	Very open mallee over *Melaleuca* sp. Kundip (Collection number GF Craig 6020) dense heath.	
	Open mallee over dense shrub heath (1.0-1.5) dominated by *Melaleuca* sp. Kundip on pale grey loamy sand with quartz rubble, occupies hill slopes. Associated species include *Melaleuca* sp. Kundip (GF Craig 6020) (P1) (dominant), *M. haplantha, M. stramentosa* (P1), *M rigidifolia, M. bracteosa, Melaleuca* sp. Gorse, *Pultenaea* sp. Kundip (GF Craig 6008) (P1), *Eucalyptus cernua, E. phaenophylla, E. pileata, Dodonaea trifida* (P3), *Acacia durabilis* (P3), *Leucopogon infuscatus and Hibbertia psilocarpa* ms. On its eastern boundary, the community abuts *Eucalyptus astringens* open low woodland and in this area there is an intergrade community.	
15	**Montane mallee of the Stirling Ranges**	Priority 1
	Thicket, mallee-thicket and heath community on mid to upper slopes of Stirling Range mountains and hills east of Red Gum Pass.	
16	**Coyanarup Wetland Suite**	Priority 1
	Microscale paluslopes associated with seepage and creeks in the area between Coyanarup Peak and Bluff Knoll in the Stirling Ranges.	
17	***Eucalyptus purpurata* woodlands (Bandalup Hill)**	Priority 1
	Eucalyptus purpurata woodlands on magnesite soils of the ridge-tops and upper slopes of Bandalup Hill	
18	***Banksia coccinea Shrubland/Eucalyptus staeri/Sheoak* Open Woodland ('Community type 14a')**	Priority 1
	Found on deep white/light grey sand on the lower slopes and valleys, usually occurring just upslope of seasonally wet drainage lines. The community is floristically very diverse and structurally quite variable. Typically *Allocasuarina fraseriana, Eucalyptus staeri, Banksia attenuata and Banksia ilicifolia* are present as emergents or as low open woodland above a *Banksia coccinea* tall open scrub, mixed open/closed heath, mixed low open heath, mixed sedgeland and open herbland. *Jacksonia spinosa* often forms a distinct stratum above the heathland, dominant heath species are *Melaleuca thymoides, Adenanthos cuneatus, Leucopogon rubricaulis, Phyllota barbata, Hypocalymma strictum* and *Leucopogon glabellus* . Common sedges and herbs include *Anarthria scabra, Lyginia barbata, Schoenus caespititius, Anarthria prolifera, Anarthria gracilis* and *Cyathochaeta equitans* . The community is highly susceptible to *Phytophthora* dieback with infestations resulting in greatly reduced floristic and structural diversity. Appears to be restricted to the Albany region.	
19	***Banksia laevigata – Banksia lemanniana* proteaceous thicket**	Priority 1
	This community occurs on laterised ridges and breakaways. Associated species generally include *Eucalyptus pleurocarpa, Adenanthos oreophilus, Leptospermum maxwellii, Beaufortia orbifolia, Taxandria spathulata* and *Stylidium albomontis* .	
20	***Eucalyptus megacornuta* mallet woodland**	Priority 1
	Associated species include the shrubs *Hovea acanthoclada, Lasiopetalum compactum, Melaleuca thapsina* . This community typically grows on rock piles and breakaways of laterised banded ironstone and pyrite formations. A vegetation study noted that *E. megacornuta* is almost confined to the Ravensthorpe Range and was considered rare (less than 1,000 plants known in conservation reserves, or few populations).	
21	**Microbial mantles of Nullarbor caves (especially Weebubbie Cave)**	Priority 1
	Significant microbial communities in underwater sections of caves.	
	Threats: uncontrolled access	
22	**Mosaic of Albany Blackbutt (*Eucalyptus staeri*) mallee-heath found on lateritic ridges and Chittick (*Lambertia inermis* subsp. *inermis*) scrub-heath on seasonally-waterlogged laterite**	Priority 1
	Regionally very restricted and very poorly reserved.	
	Threats: dieback	
23	***Banksia littoralis* woodland / *Melaleuca incana* Shrubland (South Coast Region)**	Priority 1
	Threats: fragmentation, dieback disease, hydrological change, too frequent fire, weed invasion	
24	***Banksia occidentalis/Kunzea clavata* Shrubland (South Coast Region)**	Priority 1
	Threats: dieback disease, too frequent fire, weed invasion	
25	***Astartea scoparia* Swamp Thicket (South Coast Region)**	Priority 1
	Threats: fragmentation, too frequent fire, hydrological change, weed invasion, dieback disease	
26	**Coastal *Melaleuca incana* / *Taxandria juniperina* Shrubland/ Closed Forest (South Coast Region)**	Priority 1
	Threats: fragmentation, too frequent fire, hydrological change, weed invasion, dieback disease	
27	**Tallerack (*Eucalyptus pleurocarpa*) mallee-heath on seasonally inundated soils**	Priority 2
	May have been common prior to clearing for agriculture, and the remaining occurrences of this vegetation are of high conservation significance.	

28	***Melaleuca striata /Banksia* spp. Coastal Heath**	Priority 1
	Community occurs on light grey deep sand on coastal slopes and valleys. *Melaleuca striata, Banksia attenuata* and *Banksia coccinea* dominate the closed to open heath/low heath with exposure to salt laden winds restricting the growth of the latter two species. This unit is typically dense being a closed to open heath/low heath over a dense sedgeland dominated by *Anarthria scabra* . Other common species include *Isopogon cuneatus, Adenanthos cuneatus, Astroloma baxteri, Hypocalymma strictum, Petrophile rigida, Melaleuca thymoides, Lyginia barbata* and *Hypolaena exsulca.* The community is restricted to an area in Gull Rock National Park east of Albany.	
	Threats: All known occurrences are affected by *Phytophthora* dieback and/or aerial canker. Also vulnerable to inappropriate fire regimes as the community contains serotinous obligate seeders.	
29	***Melaleuca spathulata/Melaleuca viminea* Swamp Heath**	Priority 1
	Seasonally wet heath dominated by *Melaleuca spathulata and Melaleuca viminea* in the upper stratum over an open sedgeland characterised by *Meeboldina roycei;* occurs on brown to orange brown loam overlying clay in winter-wet sumplands.	
	Threats: As a wetland community may be considered vulnerable to inappropriate fire regimes i.e. intense fire while the dominant species *Melaleuca viminea* is a serotinous obligate seeder and vulnerable to too frequent fire.	
30	***Banksia coccinea* Shrubland */Melaleuca striata / Leucopogon flavescens* Heath**	Priority 1
	Community occurs on light grey or grey deep sand on lower slopes and valleys. Structurally this unit is a diverse heathland over a diverse sedgeland dominated by *Anarthria scabra* and a very open herbland dominated by *Dasypogon bromeliifolius.* Emergent trees (*Allocasuarina fraseriana, E. marginata*) may be present along with the shrub *Taxandria angustifolia.* The community is restricted to an area in the Angove-Two-Peoples Bay - Bettys Beach area east of Albany.	
	Threats: dieback disease caused by *Phytophthora* spp., inappropriate fire regimes.	
31	**Albany Blackbutt (*Eucalyptus staeri*) mallee-heath on deep sand**	Priority 2
	The structure of the vegetation is mallee heath. *Eucalyptus staeri* to about 4-5 m in height is the most common mallee within a tall open shrub layer consistently dominated by *Agonis theiformis* and *Banksia baxteri* . *Banksia attenuata, Banksia coccinea, Hakea pandanicarpa* subsp.*crassifolia* and *Lambertia inermis* are also dominant in some occurrences. *Banksia attenuata* dominates this assemblage at occurrences with the deepest sand. *Hakea baxteri* and *Nuytsia floribunda* are other common species in the tall shrub layer. *Banksia baxteri* in the tall shrubs layer is a conspicuous indicator species of this unit. Requires further survey to confirm distribution.	
	Threats: appears to have been very extensive and common throughout the region but has been comprehensively cleared and degraded (mainly through grazing).	
32	**Subterranean faunal ecosystems of Nullarbor caves (known from Nurina Cave, Olwolgin Cave, Burnabbie Cave, N327, N1327)**	Priority 3(i)
	The caves contain communities of invertebrates, other fauna and sensitive habitats including tree roots. Caves included in this community contain at least four troglobitic taxa.	
	Threats: uncontrolled access	
33	**Swamp Yate (*Eucalyptus occidentalis*) woodlands in seasonally inundated clay basins (South Coast)**	Priority 3(iii)
	Yate woodlands with intact understorey and fringing vegetation are poorly conserved in the region.	
34	**Scrub heath on deep sand with Banksia and Lambertia, and Banksia scrub heath on Esperance Sandplain**	Priority 3(iii)
	The scrub heath forms part of Beard's Esperance System and comprises two very closely related vegetation units (bSZc & blSZc) on sand of varying depths overlying clay: Scrub heath dominated by *Banksia speciosa* and *Lambertia inermis* and other proteaceous species such as *B. media* and *Hakea* spp. (with occasional *Nuytsia floribunda* and mallee species) over herbs on deep sand (to 1m) over clay over ironstone. The scrub heath may share a number of species in common with the Mallee heath vegetation unit (e26SZc) of the Esperance System: *Eucalyptus tetragona* and. *E decipiens* with occasional *E. incrassata* , *E. redunca* over *Lambertia inermis* and *Hakea* spp. on lateritic soil over ironstone.	
35	***Granite outcrop pools with endemic aquatic fauna**	Priority 3(i)
	Freshwater pools formed on granite outcrops that may persist for several months and house a variety of aquatic invertebrates, some of which are endemic to south-west WA. Some examples include cladocerans, ostracods, copepods, rotifers, oligochaetes and molluscs.	
36	***Taxandria spathulata* Heath**	Priority 4(i)
	Community is an open heath dominated by *Taxandria spathulata* , with a sedgeland that includes *Schoenus* sp. Cape Riche Cushion and *Mesomelaena stygia* on clay loam overlying spongelite plains.	
	Threats*:* The community is vulnerable to inappropriate fire regimes with *Taxandria spathulata* being a serotinous obligate seeder.	

37	**Dense, obligate seeding Proteaceae dominated shrublands and kwongan of the Esperance Sandplains**	Priority 3(iii)
	Consists of predominantly obligate seeding proteaceous shrubland and heath (kwongan) and mallee heath on sandplain, duplex sand/clay and gravels overlying Eocene sediments, quartzite, schist, Yilgarn and Albany Fraser granite and greenstone ranges. Its flora is characterised by high species diversity and a high degree of endemism, particularly in the Stirling Range, Fitzgerald River National Park, Ravensthorpe Range and Russell Ranges. Due to the high levels of endemism, there are few species that exist across the entire range of the dense, obligate seeding Proteaceae dominated shrublands and kwongan of the Esperance Sandplains, however particular species have been identified as common dominant species in each of its ecodistricts.	
	Threats: Past threats have principally been fragmentation from land clearing, current threats are plant disease *Phytophthora cinnamomi* , increased fire frequencies, invasive weeds and feral animals.	
38	**Woodline Hills vegetation complexes (*Baeckea* sp. Barbalin previously known as B. recurva) surubland**	Priority 4(i)
	Ridge communities unique but unless a mine is proposed are currently not threatened.	
39	**Stirling Range Upland Yate community**	Priority 4(ii)
	Low woodland of *Eucalyptus cornuta* over a sparse shrub layer of *Gastrolobium velutinum* , *Chamelaucium pauciflorum* and *Thomasia foliosa* over open herbs of *Tetrarrhena laevis* , *Poa porphyroclados* , *Billardiera heterophylla* , *Clematis pubescens* , *Senecio* sp., *Hydrocotyle hirta* , *Cheilanthes austrotenuifolia* and *Asplenium flabellifolium.*	

*Community type occurs in more than one region

Total 296 (community types and sub-types)

PECs in >1 region

*Granite outcrop pools with endemic aquatic fauna

*Claypans with mid dense shrublands of *Melaleuca lateritia* over herbs

* Pools of the Avon and Dale Rivers

*Low lying *Banksia attenuata* woodlands or shrublands ('community type 21c')

*Southern Swan Coastal Plain *Eucalyptus gomphocephala - Agonis flexuosa* woodlands (type 25)

APPENDIX 6: VEGETATION CONDITION SCALE

Vegetation Condition Scale – adapted from Keighery (1994) and Kaesehagen (1995).

VEGETATION CONDITION SCALE		
Rating	**Condition**	**Descriptive Features**
1	Excellent	• >80% Native Flora Composition • Vegetation structure intact or nearly so • Minor signs of disturbance • Weeds are non-aggressive species (cover <5%)
2	Good	• 60 - 80% Native Flora Composition • Vegetation structure altered in places • Obvious signs of disturbance • Weed cover/abundance 5 -20%
3	Fair	• 40 - 60% Native Flora Composition • Vegetation structure significantly altered yet retains basic vegetation structure or ability to regenerate to it • Very obvious signs of multiple disturbance • Weed cover/abundance 20 -50%
4	Poor/Partially Degraded	• 20 - 40% Native Flora Composition • Vegetation structure severely impacted by disturbance • Scope for regeneration but not to state approaching good condition without intensive management • Weed cover/abundance 50 -80%
5	Completely Degraded	• <20% Native Flora Composition • Vegetation structure no longer intact • Extensive disturbance/modification present • Weeds are highly invasive (cover/abundance >80%)

Fire:

No fire evident/0-2 years/2-5 years/5-10 years/> 10 years

Disturbance Types:

Grazing, Clearing, Flooding, Vehicular, Machinery

APPENDIX 7: IMAGES OF INTRODUCED FLORA

INTRODUCED FLORA IMAGES

Plate H: ****Calotropis procera* **(FloraBase 2012)

Plate I: ****Cucumis melo* **(United States Department of Agriculture 2012)

Plate J: ****Melinis repens* **(Sharp and Simon 2012)

Plate K: ****Passiflora foetida* **(FloraBase 2012)

APPENDIX 8: IMAGES OF FLORA OF CONSERVATION SIGNIFICANCE

PRIORITY FLORA IMAGES

Plate E: *Eucalyptus ordiana* (P2) (Centre for Plant Biodiversity Research 2012)

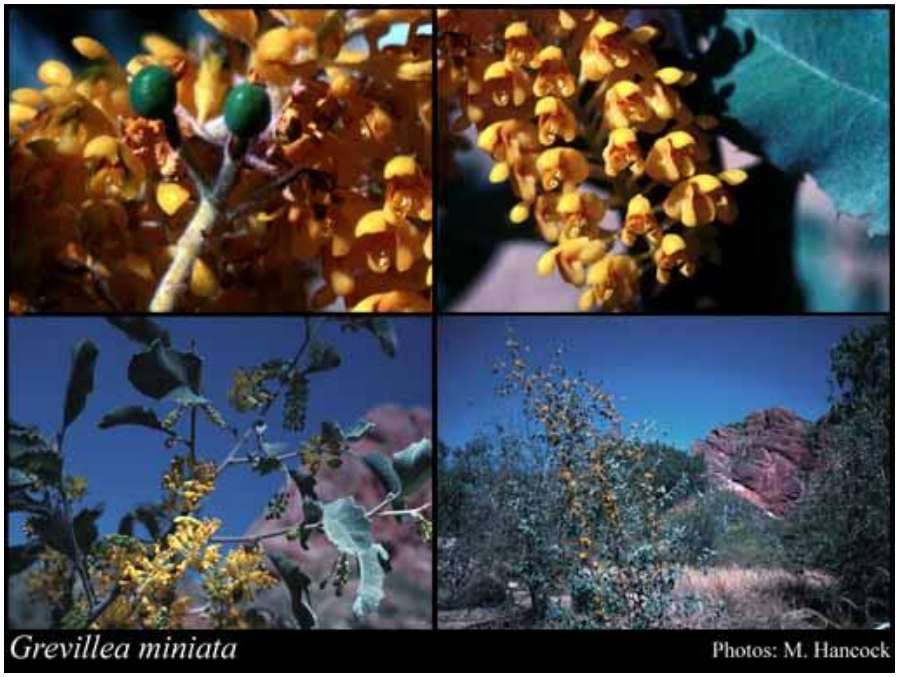


Plate F: *Grevillea miniata* (P4) (FloraBase 2012)

Plate G: *Jacquemontia* sp. Keep River (P1) (Scanned image of specimen collected during the survey)

* There are no images available of *Triodia cremnophila* (P1) or *Triodia* sp. Argyle (aff. cunninghamii) (currently nominated for priority status)

APPENDIX 9: FAUNA SPECIES POTENTIALLY OCCURRING IN THE MATSU PROJECT AREA AND ASSOCIATED ACCESS TRACK

FAUNA SPECIES POTENTIALLY OCCURRING IN THE MATSU PROJECT AREA AND ASSOCIATED ACCESS TRACK

Birds

Scientific Name	Common Name
Phasianidae	
Coturnix ypsilophora	Brown Quail
Columbidae	
Phaps chalcoptera	Common Bronzewing
Phaps histrionica	Flock Bronzewing
Ocyphaps lophotes	Crested Pigeon
Geophaps plumifera	Spinifex Pigeon
Petrophassa albipennis	White-quilled Rock-Pigeon
Geopelia cuneata	Diamond Dove
Geopelia striata	Peaceful Dove
Geopelia humeralis	Bar-shouldered Dove
Podargidae	
Podargus strigoides	Tawny Frogmouth
Eurostopodidae	
Eurostopodes argus	Spotted Nightjar
Aegothelidae	
Aegotheles cristatus	Australian Owlet-nightjar
Apodidae	
Apus pacificus	Fork-tailed Swift
Accipitridae	
Elanus axillaris	Black-shouldered Kite
Lophoictinia isura	Square-tailed Kite
Hamirostra melanosternon	Black-breasted Buzzard
Haliastur sphenurus	Whistling Kite
Milvus migrans	Black Kite
Accipiter fasciatus	Brown Goshawk
Accipiter cirrocephalus	Collared Sparrowhawk
Accipiter novaehollandiae	Grey Goshawk
Aquila audax	Wedge-tailed Eagle
Hieraaetus morphnoides	Little Eagle
Falconidae	
Falco cenchroides	Nankeen Kestrel
Falco berigora	Brown Falcon
Falco longipennis	Australian Hobby
Falco subniger	Black Falcon
Falco peregrinus	Peregrine Falcon
Turnicidae	
Turnix maculosus	Red-backed Button-quail
Turnix pyrrhothorax	Red-chested Button-quail
Turnix velox	Little Button-quail
Cacatuidae	

Scientific Name	Common Name
Calyptorhynchus banksii	Red-tailed Black-Cockatoo
Eolophus roseicapillus	Galah
Cacatua sanguinea	Little Corella
Cacatua galerita	Sulphur-crested Cockatoo
Nymphicus hollandicus	Cockatiel
Psittacidae	
Trichoglossus haematodus	Rainbow Lorikeet
Psitteuteles versicolor	Varied Lorikeet
Aprosmictus erythropterus	Red-winged Parrot
Platycercus venustus	Northern Rosella
Melopsittacus undulatus	Budgerigar
Cuculidae	
Centropus phasianinus	Pheasant Coucal
Eudynamys scolopaceus	Asian Koel
Scythrops novaehollandiae	Channel-billed Cuckoo
Chalcites basalis	Horsfield's Bronze-cuckoo
Chalcites osculans	Black-eared Cuckoo
Cacomantis pallidus	Pallid Cuckoo
Cacomantis variolosus	Brush Cuckoo
Strigidae	
Ninox connivens	Barking Owl
Ninox novaeseelandiae	Southern Boobook
Halcyonidae	
Dacelo leachii	Blue-winged Kookaburra
Todiramphus pyrrhopygius	Red-backed Kingfisher
Todiramphus sanctus	Sacred Kingfisher
Meropidae	
Merops ornatus	Rainbow Bee-eater
Coraciidae	
Eurystomus orientalis	Dollarbird
Climacteridae	
Climacteris melanura	Black-tailed Treecreeper
Ptilonorhynchidae	
Ptilonorhynchus nuchalis	Great Bowerbird
Maluridae	
Malurus melanocephalus	Red-backed Fairy-wren
Acanthizidae	
Smicrornis brevirostris	Weebill
Pardalotidae	
Pardalotus rubricatus	Red-browed Pardalote
Pardalotus striatus	Striated Pardalote
Meliphagidae	
Lichenostomus virescens	Singing Honeyeater
Lichenostomus unicolor	White-gaped Honeyeater
Lichenostomus plumulus	Grey-fronted Honeyeater
Lichenostomus flavescens	Yellow-tinted Honeyeater

Scientific Name	Common Name
Manorina flavigula	Yellow-throated Miner
Conopophila rufogularis	Rufous-throated Honeyeater
Cissomela pectoralis	Banded Honeyeater
Lichmera indistincta	Brown Honeyeater
Melithreptus gularis	Black-chinned Honeyeater
Melithreptus albogularis	White-throated Honeyeater
Entomyzon cyanotis	Blue-faced Honeyeater
Philemon argenticeps	Silver-crowned Friarbird
Philemon citreogularis	Little Friarbird
Pomatostomidae	
Pomatostomus temporalis	Grey-crowned Babbler
Neosittidae	
Daphoenositta chrysoptera	Varied Sittella
Campephagidae	
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Coracina papuensis	White-bellied Cuckoo-shrike
Lalage sueurii	White-winged Triller
Pachycephalidae	
Pachycephala rufiventris	Rufous Whistler
Colluricincla woodwardi	Sandstone Shrike-thrush
Colluricincla harmonica	Grey Shrike-thrush
Oriolidae	
Oriolus sagittatus	Olive-backed Oriole
Artamidae	
Artamus leucorynchus	White-breasted Woodswallow
Artamus personatus	Masked Woodswallow
Artamus cinereus	Black-faced Woodswallow
Artamus minor	Little Woodswallow
Cracticus torquatus	Grey Butcherbird
Cracticus nigrogularis	Pied Butcherbird
Cracticus tibicen	Australian Magpie
Rhipiduridae	
Rhipidura albiscapa	Grey Fantail
Rhipidura rufiventris	Northern Fantail
Rhipidura leucophrys	Willie Wagtail
Corvidae	
Corvus bennetti	Little Crow
Corvus orru	Torresian Crow
Monarchidae	
Grallina cyanoleuca	Magpie-lark
Myiagra inquieta	Restless Flycatcher
Myiagra rubecula	Leaden Flycatcher
Petroicidae	
Microeca fascinans	Jacky Winter
Alaudidae	
Mirafra javanica	Horsfield's Bushlark

Scientific Name	Common Name
Cisticolidae	
Cisticola exilis	Golden-headed Cisticola
Megaluridae	
Cincloramphus mathewsi	Rufous Songlark
Hirundinidae	
Hirundo rustica	Barn Swallow
Petrochelidon ariel	Fairy Martin
Petrochelidon nigricans	Tree Martin
Dicaeidae	
Dicaeum hirundinaceum	Mistletoebird
Estrildidae	
Taeniopygia guttata	Zebra Finch
Taeniopygia bichenovii	Double-barred Finch
Poephila acuticauda	Long-tailed Finch
Poephila personata	Masked Finch
Erythrura gouldiae	Gouldian Finch
Lonchura castaneothorax	Chestnut-breasted Mannikin
Heteromunia pectoralis	Pictorella Mannikin
Motacillidae	
Anthus novaeseelandiae	Australasian Pipit

Mammals

Scientific Name	Common Name
Tachyglossidae	
Tachyglossus aculeatus	Short-beaked Echidna
Dasyuridae	
Planigale ingrami	Long-tailed Planigale
Planigale maculata	Common Planigale
Pseudantechinus ningbing	Ningbing False Antechinus
Sminthopsis macroura	Stripe-faced Dunnart
Macropodidae	
Macropus robustus	Euro
Petrogale brachyotis	Short-eared Rock-wallaby
Petropodidae	
Pteropus alecto	Black Flying-fox
Megadermatidae	
Macroderma gigas	Ghost Bat
Hipposideridae	
Hipposideros stenotis	Northern leaf-nosed bat
Rhinonicteris aurantia	Orange leaf-nosed bat
Emballonuridae	
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat

Scientific Name	Common Name
Taphozous georgianus	Common Sheathtail-bat
Molossidae	
Chaerephon jobensis	Northern Freetail-bat
Mormopterus beccarrii	Beccarri's Freetail-bat
Vespertilionidae	
Chalinolobus gouldii	Gould's Wattled Bat
Chalinolobus nigrogriseus	Hoary Wattled Bat
Miniopterus schreibersii orianae	Common Bentwing-bat
Scotorepens greyii	Little Broad-nosed Bat
Scotorepens sanborni	Northern Broad-nosed Bat
Vespadelus caurinus	Western Cave Bat
Muridae	
Leggadina lakedownensis	Short-tailed Mouse
Melomys burtoni	Grassland Melomys
Mus musculus	House Mouse
Pseudomys laborifex	Kimberley Mouse
Pseudomys nanus	Western Chestnut Mouse
Rattus tunneyi	Pale Field-rat
Rattus villosissimus	Long-haired Rat
Zyzomys argurus	Common Rock-rat
Zyzomys woodwardi	Kimberley Rock-rat
Canidae	
Canis lupus dingo	Dingo
Canis lupus familiaris	Dog
Felidae	
Felis catus	Cat
Bovidae	
Bos taurus	Cattle

Reptiles

Scientific Name	Common Name
Agamidae	
Amphibolurus gilberti	Gilbert's Dragon
Chlamydosaurus kingii	Frilled Neck Lizard
Ctenophorus nuchalis	Central Netted Dragon
Diporiphora arnhemica	
Diporiphora bennettii	
Diporiphora lalliae	
Diporiphora magna	
Diplodacylidae	
Amalosia rhombifer	
Diplodactylus conspicillatus	Fat-tailed Gecko
Lucasium stenodactylum	
Rhynchoedura sexapora	Northern Beaked Gecko

Strophurus ciliaris subsp. *aberrans*	
Strophurus ciliaris subsp. *ciliaris*	
Strophurus taeniatus	
Carphodactylidae	
Nephrurus sheai	
Gekkonidae	
Gehyra australis	
Gehyra nana	
Gehyra punctate	
Heteronotia bynoei	Bynoe's Gecko
Heteronotia planiceps	
Pygopodidae	
Delma borea	
Delma tincta	
Lialis burtonis	
Pygopus steelescotti	
Scincidae	
Carlia amax	
Carlia gracilis	
Carlia munda	
Carlia tricantha	
Cryptoblepharus metallicus	
Cryptoblepharus ruber	
Ctenotus alacer	
Ctenotus burbidgei	
Ctenotus decaneurus	Ten-lined Ctenotus
Ctenotus inornatus	
Ctenotus pantherinus subsp. *calx*	
Ctenotus piankai	
Ctenotus robustus	
Ctenotus saxatilis	Rock Ctenotus
Ctenotus schomburgkii	
Eremiascincus richardsonii	Broad-banded Sand Swimmer
Menetia greyii	
Menetia maini	
Morethia ruficauda subsp. *ruficauda*	
Proablepharus tenuis	
Tiliqua multifasciata	Central Blue-tongue
Tiliqua scincoides subsp. *intermedia*	Eastern Blue-tongue
Varanidae	
Varanus acanthurus	Spiny-tailed Monitor
Varanus glauerti	Kimberley Rock Monitor
Varanus glebopalma	Black-palmed Rock Monitor
Varanus gouldii	Sand Monitor
Varanus kingorum	
Varanus mertensi	Mertens' Water Monitor
Varanus mitchelli	Mitchell's Water Monitor
Varanus panoptes subsp. *panoptes*	Yellow-spotted Monitor

Varanus scalaris	Spotted Tree Monitor
Varanus storri subsp. *ocreatus* *Varanus tristis* subsp. *tristis*	 Racehorse Monitor
Typholpidae *Ramphotyphlops guentheri* *Ramphotyphlops ligatus*	
Boidae *Antaresia childrenii* *Aspidites melanocephalus* *Liasis olivaceus* subsp. *olivaceus*	 Children's Python Black-headed Python Olive Python
Colubridae *Boiga irregularis* *Dendrelaphis punctulatus*	 Brown Tree Snake Green Tree Snake
Elapidae *Acanthophis praelongus* *Brachyurophis roperi* *Demansia papuensis* *Demansia vestigiata* *Furina ornata* *Pseudechis australis* *Pseudonaja modesta* *Pseudonaja mengdeni* *Suta punctata* *Vermicella multifasciata*	 Northern Death Adder Great Black Whipsnake Lesser Black Whipsnake Moon Snake Mulga Snake Ringed Brown Snake Gwardar Spotted Snake

Amphibians

Scientific Name	Common Name
Hylidae *Cyclorana australis* *Cyclorana cultripes* *Cyclorana longipes* *Litoria bicolor* *Litoria caerulea* *Litoria coplandi* *Litoria inermis* *Litoria meiriana* *Litoria nasuta* *Litoria rothii* *Litoria rubella* *Litoria splendida* *Litoria tornieri*	 Giant Frog Knife-footed Frog Long-footed Frog Northern Dwarf Tree Frog Green Tree Frog Rock Frog Bumpy Rocket Frog Rockhole Frog Striped Rocket Frog Northern Laughing Tree Frog Little Red Tree Frog Splendid Tree Frog Black-shinned Rocket Frog
Myobatrachidae *Uperoleia borealis* *Uperoleia trachyderma*	 Northern Toadlet Blacksoil Toadlet

Limnodynastidae	
Limnodynastes lignarius	Carpenter Frog
Platyplectrum ornatum	Ornate Burrowing Frog
Bufonidae	
Rhinella marina	Cane Toad

APPENDIX 10: FAUNA SPECIES RECORDED DURING THE 2012 SURVEY

FAUNA SPECIES RECORDED DURING THE 2012 FIELD SURVEY

BIRDS

Scientific Name	Common Name
Phasianidae	
Coturnix ypsilophora	Brown Quail
Columbidae	
Petrophassa albipennis	White-quilled Rock-Pigeon
Geopelia cuneata	Diamond Dove
Geopelia striata	Peaceful Dove
Podargidae	
Podargus strigoides	Tawny Frogmouth
Aegothelidae	
Aegotheles cristatus	Australian Owlet-nightjar
Accipitridae	
Lophoictinia isura	Square-tailed Kite
Milvus migrans	Black Kite
Accipiter cirrocephalus	Collared Sparrowhawk
Aquila audax	Wedge-tailed Eagle
Falconidae	
Falco berigora	Brown Falcon
Falco cenchroides	Nankeen Kestrel
Psittacidae	
Platycercus venustus	Northern Rosella
Melopsittacus undulatus	Budgerigar
Cuculidae	
Centropus phasianinus	Pheasant Coucal
Halcyonidae	
Todiramphus pyrrhopygius	Red-backed Kingfisher
Meropidae	
Merops ornatus	Rainbow Bee-eater
Ptilonorhynchidae	
Ptilonorhynchus nuchalis	Great Bowerbird
Maluridae	
Malurus melanocephalus	Red-backed Fairy-wren
Acanthizidae	
Smicrornis brevirostris	Weebill
Pardalotidae	
Pardalotus striatus	Striated Pardalote
Meliphagidae	
Lichenostomus plumulus	Grey-fronted Honeyeater
Manorina flavigula	Yellow-throated Miner
Conopophila rufogularis	Rufous-throated Honeyeater
Lichmera indistincta	Brown Honeyeater
Melithreptus albogularis	White-throated Honeyeater
Philemon argenticeps	Silver-crowned Friarbird

Scientific Name	Common Name
Neosittidae	
Daphoenositta chrysoptera	Varied Sittella
Campephagidae	
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Coracina papuensis	White-bellied Cuckoo-shrike
Lalage sueurii	White-winged Triller
Pachycephalidae	
Pachycephala rufiventris	Rufous Whistler
Colluricincla woodwardi	Sandstone Shrike-thrush
Artamidae	
Artamus personatus	Masked Woodswallow
Artamus minor	Little Woodswallow
Cracticus torquatus	Grey Butcherbird
Cracticus nigrogularis	Pied Butcherbird
Rhipiduridae	
Rhipidura rufiventris	Northern Fantail
Rhipidura leucophrys	Willie Wagtail
Monarchidae	
Myiagra rubecula	Leaden Flycatcher
Megaluridae	
Cincloramphus mathewsi	Rufous Songlark
Hirundinidae	
Hirundo nigricans	Tree Martin
Dicaeidae	
Dicaeum hirundinaceum	Mistletoebird
Estrildidae	
Taeniopygia bichenovii	Double-barred Finch

BATS

Scientific Name	Common Name
Megadermatidae	
Macroderma gigas	Ghost Bat
Hipposideridae	
Rhinonicteris aurantius	Orange Leafnosed-bat
Emballonuridae	
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat
Taphozous georgianus	Common Sheathtail-bat
Vespertilionidae	
Chalinolobus gouldii	Gould's Wattled Bat
Chalinolobus nigrogriseus	Hoary Wattled Bat
Miniopterus schreibersi	Common Bentwing-bat
Scotorepens greyii	Little Broad-nosed Bat
Vespadelus caurinus	Western Cave Bat
Molossidae	
Chaerephon jobensis	Northern Freetail-bat

APPENDIX 11: APM RIOP GOULDIAN FINCH NEST ASSESSMENT

Kimberley Metals Group Pty Ltd
Ridges Iron Ore Project:
Gouldian Finch Nest Assessment

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Summary

This paper describes an assessment of the potential impact of the Ridges Iron Ore Project on breeding habitat of the Gouldian Finch, *Erythrura gouldiae*.

A total of 24 trees, supporting 33 potentially suitable nesting hollows were located in 17 quadrats surveyed across areas targeted for impact from ore extraction, the creation of waste dumps and the movement of vehicles.

An average of 1.41 trees supporting hollows occur per hectare within the mine impact footprint, supporting 1.94 potential nesting hollows per hectare. The potential for nesting on the RIOP mine site area appears to be low in comparison to other studies.

Based on nest density calculations of previous authors from other locations, between 62 and 170 nests could occur in 750 hollow-bearing trees located with the 125ha impact area.

Based on the ecology, including longevity and behaviour related to nest-site selection, Gouldian Finches readily utilise artificial nest hollows. Therefore, where there are disturbances to potential nest sites from clearing, breeding in an area can continue successfully provided that key resources, such as nest hollows, proximity to feeding grounds and water are maintained.

Based on the outcomes of this survey Kimberley Metals Group will commit to the establishment of a suitable number of artificial nesting hollows to compensate for clearing during the RIOP. It is anticipated that nest boxes will be established in the 2010 dry season in preparation for the 2011 breeding season. It is anticipated that the first artificial nest box study site would be located north of March Fly creek and commence with the establishment of 100 nest boxes.

The utilisation of these next boxes will be monitored bi-annually in April and July as part of the ongoing management of the RIOP. Data will be exchanged with research groups at Macquarie University associated with the Save the Gouldian Fund.

Contents

1 Introduction

As part of the overall environmental impact assessment for the Ridges Iron Ore Project (RIOP), the RIOP mine site, located approximately 165 south of Wyndham, has been specifically assessed to determine potential impacts on the Gouldian Finch, *Erythrura gouldiae*. The Gouldian Finch is currently listed as Endangered and Migratory under the Environment Protection and Biodiversity Conservation Act 1999 (cth) and listed as "rare or likely to become extinct" under the Wildlife Conservation Act 1950.

1.1 Distribution

Gouldian Finches, *Erythrura gouldiae*, are distributed throughout Western Australia in the North Kimberley, south to Beagle Bay, Oobagooma, King Leopold Ranges, middle of the Durack River, Dunham River and Lake Argyle. They can also be found further south, for example in Derby and Louisa Downs. Gouldian Finches are also distributed throughout the north of the Northern Territory and the north of Queensland. They are generally classed as moderately common in the northern, central and eastern Kimberley and the lower Ord drainage area, but are uncommon or scarce in most of the southern Kimberley (Johnstone and Storr 2004).

1.2 General Habitat and Behaviour

The ecology and breeding biology of the Gouldian Finch is relatively well known and many aspects of the biology of the species have been published in peer reviewed journals (Brazill-Boast et al. In press; Tidemann and Woinarski 1994; Tidemann et al. 1992; Tidemann et al. 1999).

Gouldian Finches prefer a habitat of grassy open forests and woodlands that are near to drinkable water. When breeding they like rough country with stony hills and Eucalyptus brevifolia, snappy gum. Gouldian Finches feed on ripe and unripe small seeds of *Sorghum plumosum*, *Eriachne obtusa*, *Eragrostis* sp. and Spinifex. They also feed on insects such as flying termites and small spiders.

Gouldian Finches usually nest in small tree hollows, from February to August depending on the region and seasonal rainfall, and occasionally the hollow is lined on the bottom forming a frail cup. They sometimes breed in small colonies with several breeding pairs in close proximity. Up to 5 (average 4) eggs are laid in April, May and June. Incubation period is 12 – 14 days, while the fledging period is 20 – 21 days. Courtship displays are obvious and well documented (Johnstone and Storr 2004).

Gouldian Finches have very specific nesting requirements and require robust hollows of a finite diameter in *Eucalyptus brevifolia* (Tidemann et al. 1992; 1999) and *Corymbia*

dichromophloia (Brazill-Boast et al. In press.). These trees are used throughout the breeding season, as Gouldian Finches can breed on multiple occasions from late February to late July (Tidemann and Woinarski 1994). There appears to be a heavy reliance on feeding habitat located immediately adjacent to breeding habitat. Therefore, the presence of Sorghum and Triodia grass species in close proximity to nesting hollows is essential. O'Malley (2006) states that breeding habitat is characterised by rocky hills with hollow-bearing smooth barked gums within two to four kilometres of small waterholes or springs that persist through the dry season, although there are records of breeding in several other habitats (Ron Johnstone and George Swann pers comm.). Those authors who have data on nest site density report nest site density of 1.36 per hectare (Brazill-Boast et al. In press.). Tidemman et al. (1999) reports nesting density at one site of 0.5 per hectare.

1.3 Ridges Iron Ore Project

The Ridges Iron Ore Project (RIOP) mine site includes two shallow open pits (known as the Sam and Tony deposits), crushing facilities, offices and workshop, camp facilities and support infrastructure such as production bores, bulk diesel storage, a small powerhouse, access roads and haul roads. The total area proposed for disturbance is 125 ha, comprising a larger area on the ridge top where the mine pits are located (the focus of this study), and a smaller area on the surrounding plains.

1.4 Gouldian Finches and the Ridges Iron Ore Project

Historically, local populations of the Gouldian Finch have been located at Argyle Diamond Mine (O'Connor unpub.). Individuals were also sighted approximately 5km north of the RIOP mine pit area (ecologia 2005). The recording at RIOP was made during the 2005 wet season survey undertaken by ecologia Environment for the then proponent, Resource Mining Corporation. During that survey three individuals, including two males and one female, were recorded

Recent survey work at RIOP by expert Kimberley ornithologist George Swann, in August 2009, failed to reveal further records of individuals in the area. This is despite six person days of survey work across the ridge top of the RIOP mine site. Moreover, targeted monitoring of perennial water sources near to the impact area achieved no records, despite it being the peak of the dry season. There are three major perennial water sources within 3km of the RIOP mine impact footprint.

1.5 Purpose of the Current Survey

The current survey was designed to assess the possible impact of the RIOP mine site on Gouldian Finch breeding habitat.

Relevant to the current proposal and the potential impacts of the RIOP, it is important to identify the current threatening processes for Gouldian Finch, before making an assessment on the additional potential impacts from the proposed RIOP mine site. O'Malley (2006), in the National Recovery Plan for the Gouldian Finch (*Erythrura gouldiae*), identifies that the primary threat for this species is vegetation change through inappropriate fire regimes and grazing impacts of stock and feral herbivores. These factors have contributed to ongoing declines and absence of recovery in populations. The recovery plan also cites air sac mites (*Sternostoma tracheacolum*) and possible climate change as other factors. However, in the appendix to O'Malley (2006), the authors do refer to impacts at the local scale through loss of nesting hollows due to wildfire.

Despite the fact that loss of nesting hollows may not be the major impact on decline in numbers of Gouldian Finch, it is inherently obvious that maintenance of nesting hollows in what is considered to be ideal habitat for breeding finches, is an appropriate way to assist in the recovery of the species (Brazill-Boast et al. in press.). This is primarily due to the fact that nest success for Gouldian Finches is constrained by their specialised niche requirements and overlap with more competitive species, such as the Long-tailed finch (*Poephila acuticauda*).

There are potential impacts arising from the proposed project and these impacts need to be specifically addressed and managed to minimise potential disturbance to the Gouldian Finch. At the RIOP mine site the primary impacts will be clearing of potential nest site hollows within the mine impact footprint (ore body and overburden dumps). Secondary impacts may include the influence of dust, noise and vibration on habitat use by the Gouldian Finch and potential contamination of local water sources.

The primary impact of loss of hollow-bearing trees that may be used for nesting by Gouldian Finches may be offset by the provision of artificial nest hollows, the success of which is reported in Brazill-Boast et al. In prep.). It is the objective of this study to quantify the potential requirement for artificial nest boxes to offset disturbance associated with clearing, dust and noise from the proposed RIOP.

2 Methods

2.1 Study Site

The RIOP is situated within the East Kimberley region of Western Australia. The Mine Site is located 165km by road south of Wyndham adjacent to the Great Northern Highway. Argyle Diamond Mine and the Doon Doon roadhouse and community are the closest other establishments being 20km and 35km away respectively (Figure 1).

2.2 Tree Density

Individual trees, discernable on a detailed aerial photograph of the site with the mine impact footprint and waste dump boundaries superimposed over the aerial, were counted to provide an approximation of tree density across the RIOP mine site.

2.3 Sampling

A total of 17 sites were randomly chosen across one of the two deposits (Figure 2a-c). The intent was to use the data collected from each of the sites to extrapolate the number of potential nest sites across the RIOP mine area. As the site selection was random, no specific habitat was favoured for assessment that may lead to a positive bias in nest hollow calculations. Sites were sampled in low lying alluvial gullies, and low, moderate and steep slopes. All sites supported various Eucalyptus and Corymbia species. The majority of sites were on stony or rocky substrates (see Plates 1 - 3). Appendix 1 includes all field notes and Appendix 2 shows each of the 17 sites sampled.

Plate 1: Flat gravel site.

Plate 2: Low stony slopes

Plate 3: Steep stony slope

Ornithologists George Swann and Adrian Boyle searched each 50 x 50m quadrat and assessed the potential of hollows using binoculars. All trees that supported hollows in any condition between 35mm and 100mm diameter were marked with flagging tape. A ladder was ascended to closely assess all hollows that were reasonable accessible. The ladder utilised was 4.5m in length, enabling close assessment of nest hollows at that height (Plate 4). Where accessible tree hollows were at a greater height than the ladder, the tree was climbed (Plate 5).

Plat 5: Ascending beyond ladder height

Plate 4: Ascending to ladder height

Where a suitable nest hollow was found the diameter of the aperture, the direction the aperture faced, the species of tree and the height of the hollow above the ground was recorded.

3 Results

A total of approximately 5040 trees were discernable from aerial photography within the mine impact footprint. Approximately 3410 were located in the mine site ore body impact footprint and a further 1630 were located in the overburden or waste dump areas.

Table 1 presents a summary of the sites assessed, including the number of trees, the number of potential nesting hollows and the heights of potential nesting hollows in each quadrant. Raw data are presented in Appendix 1.

Table 1: Summary of data from each of the 17 quadrats assessed.

Site	Number of Potential Nest Trees	Number of Potential Nest Sites	Height
Site 1	0	0	
Site 2	1	1	3.7
	1	1	4.7
		1	4.5
	1	1	9.8
Site 3	1	1	4
		1	4.2
		1	
Site 4	1	1	
	1	1	
		1	2.4
Site 5	1	1	3.8
	1	1	4.3
Site 6	1	1	3.6
	1	1	3.1
	1	1	3.3
		1	3.8
		1	2.7
		1	5.1
Site 7	1	1	
Site 8	1	1	2.2
	1	1	3.4
	1	1	2.5
		1	3.1
			4.9
Site 9	1	1	2.2
	1	1	3.9
	1	1	2.1
	1	1	2.5

Site	Number of Potential Nest Trees	Number of Potential Nest Sites	Height
	1	1	3.3
		1	3.4
Site 10	1	1	3
Site 11	1	1	5.5
Site 12	1	1	
Site 13	0	0	
Site 14	0	0	
Site 15	0	0	
Site 17	0	0	
Site 18	1	1	3.1
Total	**24**	**33**	
Average per site	**1.41**	**1.94**	**3.72**
Average per Ha	**6**	**8.25**	

Using the results from Table 1 and the number of trees counted from aerial photography it was possible to approximate the total number of hollow bearing trees, or trees that have the potential to support nests, in the RIOP mine site. Based on the results of the 17 quadrats surveyed, six trees per hectare were found to support hollows suitable for nesting. Within each hectare there were approximately 8.25 potential nest hollows. Table 2 shows that 14.88% of the trees within each hectare support hollows. Based on the number of trees in the 125ha impact footprint, approximately 750 trees are likely to support 1031 nests.

Furthermore, knowing the size of the total lease areas held by Kimberley Metals Group Pty Ltd, it was possible to count the number of hollow bearing trees across the total lease area. Approximately, 415 200 supporting 570 900 hollows are likely to occur across the impact area.

The potential clearing from RIOP will result in the loss of 0.2% of the trees on the total lease area.

Table 2: Extrapolations based on number of trees counted from aerial photography

	Number of Trees	Number of Hollows
Total trees in impact zone	5040	
Total Ha in impact zone	125 Ha	
Trees per Ha in impact zone	40.32	
% Trees likely to support nests	14.88%	20.46%
Number of trees likely to support nests	750	1031.25
Total Ha of mine lease	69200 Ha	
Extrapolated number of trees on lease	2790144	
Number of trees likely to support nests	415200	570900

4 Discussion

A total of 24 trees, supporting 33 potentially suitable nesting hollows were located in 17 quadrats. Many more hollows were recorded in trees within quadrats, however these were full of detrital material or termites. An average of 1.41 trees supporting hollows occur per hectare within the mine impact footprint, supporting 1.94 nesting hollows per hectare. Brazill-Boast et al. (in press) reports that potential nest sites occur at density of 4.6 per hectare and Gibbons and Lindenmayer (2002) report up to 27 nesting hollows per hectare. Thus the potential for nesting on the RIOP mine site area appears to be low in comparison to other studies. It is anticipated that, based on the dynamic formation and destruction of potential nesting hollows over time calculated by other authors (Tidemann et al. 1999, Brazill-Boast et al. In press) and the number of trees likely to support nesting hollows in the future, that this number may remain fairly consistent over time.

Direct impacts from RIOP mine on potential nesting sites for Gouldian Finch could impact 1031 nest hollows, or 0.2% of hollow-bearing trees in the area. It is important to note that within all trees investigated no nesting material was found. However, this is not unusual given that Gouldian Finches nest using very little material and nest deep within hollows.

Based on nest density calculations of Brazill-Boast et al. (In press.) and Tidemman et al. (1999), between 62 and 170 nests could occur in 750 hollow-bearing trees located with the 125ha impact area. Furthermore, 94 112 nests could occur in the 69, 200 ha of the greater lease area.

These calculations of potential nesting density would exceed actual numbers of breeding finches in the area by several orders of magnitude. However, the data do suggest that the RIOP lease sites may be suitable to assist in regional management of this species, particularly given that breeding habitat attributes such as slope, proximity to feeding areas and water contribute to the potential value of the area.

Gouldian Finches are highly fecund birds and more fecund than 14 other multi-brooded Australian passerines (Rowley and Russell 1991). Despite this, studies elsewhere have shown that only a few banded adults found breeding in one year returned to the study are in subsequent years and far fewer nestlings and juveniles (Tidemann et al. 1999). This is most likely due to high dispersal and low survival rates, post-breeding (S. Pryke pers comm.). Therefore nest fidelity must be limited to a single year. No pair bonds are maintained across seasons and repeat nesting pairs are equally likely to select a few hollows in which to breed, as they were to re-use the same hollow (Tidemann et al. 1999). Gouldian Finches will use the same hollow a number of times if the hollow is not destroyed by fire or sealed by termites. It is for these reasons that this species utilise artificial nest hollows. Even pairs that are successfully breeding, continue to investigate other hollows.

Low fidelity of Gouldian Finches may be a result of high post breeding mortality, but it could also be due to the attrition of nest sites. Whatever the case there is very good evidence to suggest that breeding in an area can continue successfully in spite of disturbance, provided that key resources, such as nest hollows, proximity to feeding grounds and water are maintained as is the case on the RIOP leases outside of the impact area.

Many studies have demonstrated that the provision of artificial nest-boxes can stimulate reproduction and increase fledging in wild populations. Brazill-Boast et al. (in prep) shows that the provision of nest boxes for Gouldian finches leads to earlier nesting, larger clutches and a greater fledgling rate. Increase in breeding densities can be up to 240% greater than natural hollow nesting populations, with 338% increased fledging. Thus nest boxes are an important part of management and recovery of this species, are custom built to satisfy the niche requirements of Gouldian Finches and are readily available for purchase through the Save the Gouldian Fund (the Fund).

Based on the outcomes of this survey Kimberley Metals Group will commit to the establishment of a suitable number of artificial nesting hollows to compensate for clearing during the RIOP. It is anticipated that nest boxes will be established in the 2010 dry season in preparation for the 2011 breeding season. The outer entrance tunnels for the nest boxes will be constructed from hollow timber sourced from clearing on site or from existing fallen trees, and provided to the Save the Gouldian Fund to be fitted to the nesting chamber. Completed nest boxes will be purchased from the Fund and established on site beyond the periphery of the impact area, but within the same habitat type and proximity to water. It is anticipated that the first artificial nest box study site would be located north of March Fly creek and commence with the establishment of 100 nest boxes.

The utilisation of these next boxes will be monitored bi-annually in April and July as part of the ongoing management of the RIOP. Data will be exchanged with research groups at Macquarie University associated with the Save the Gouldian Fund.

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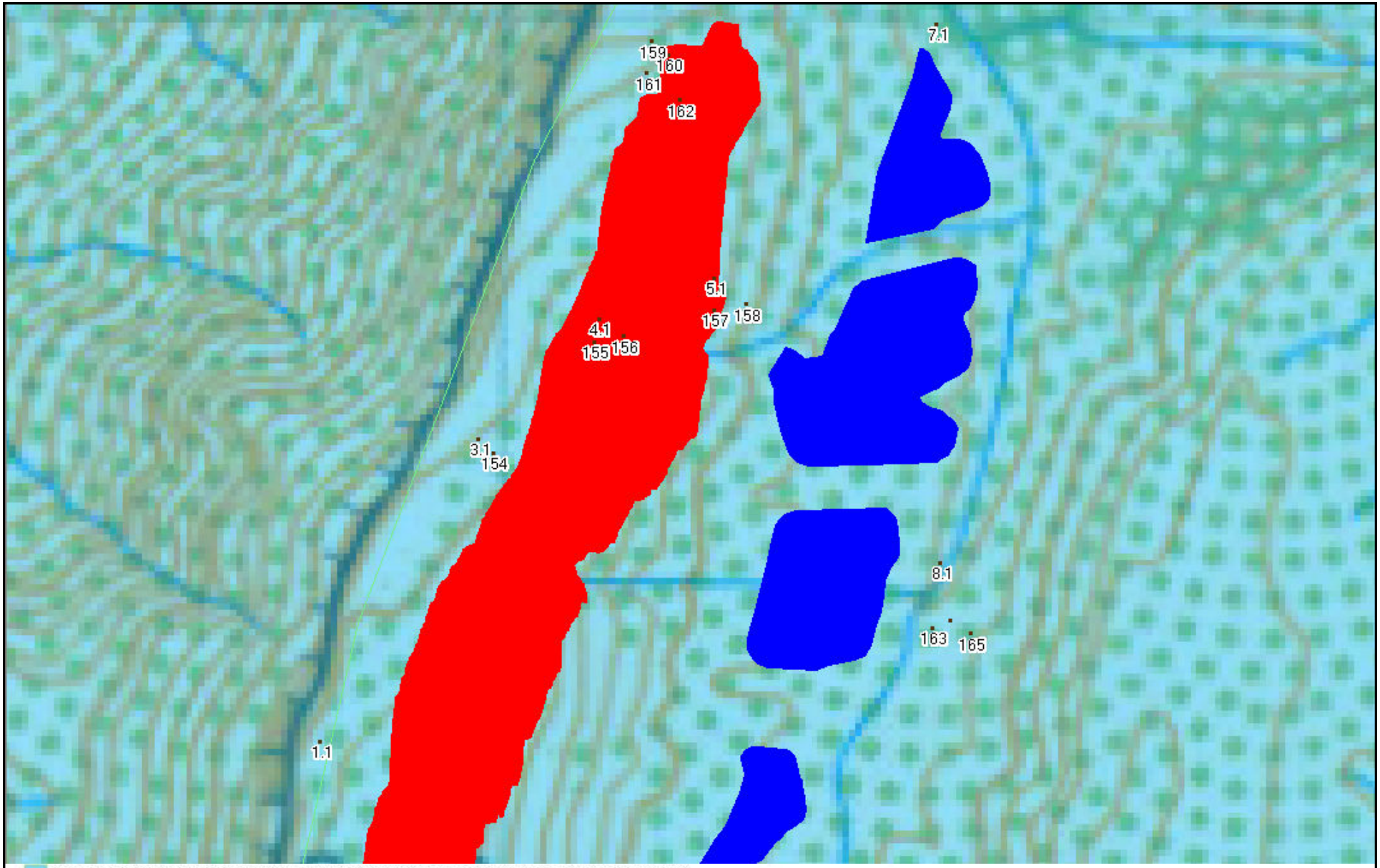
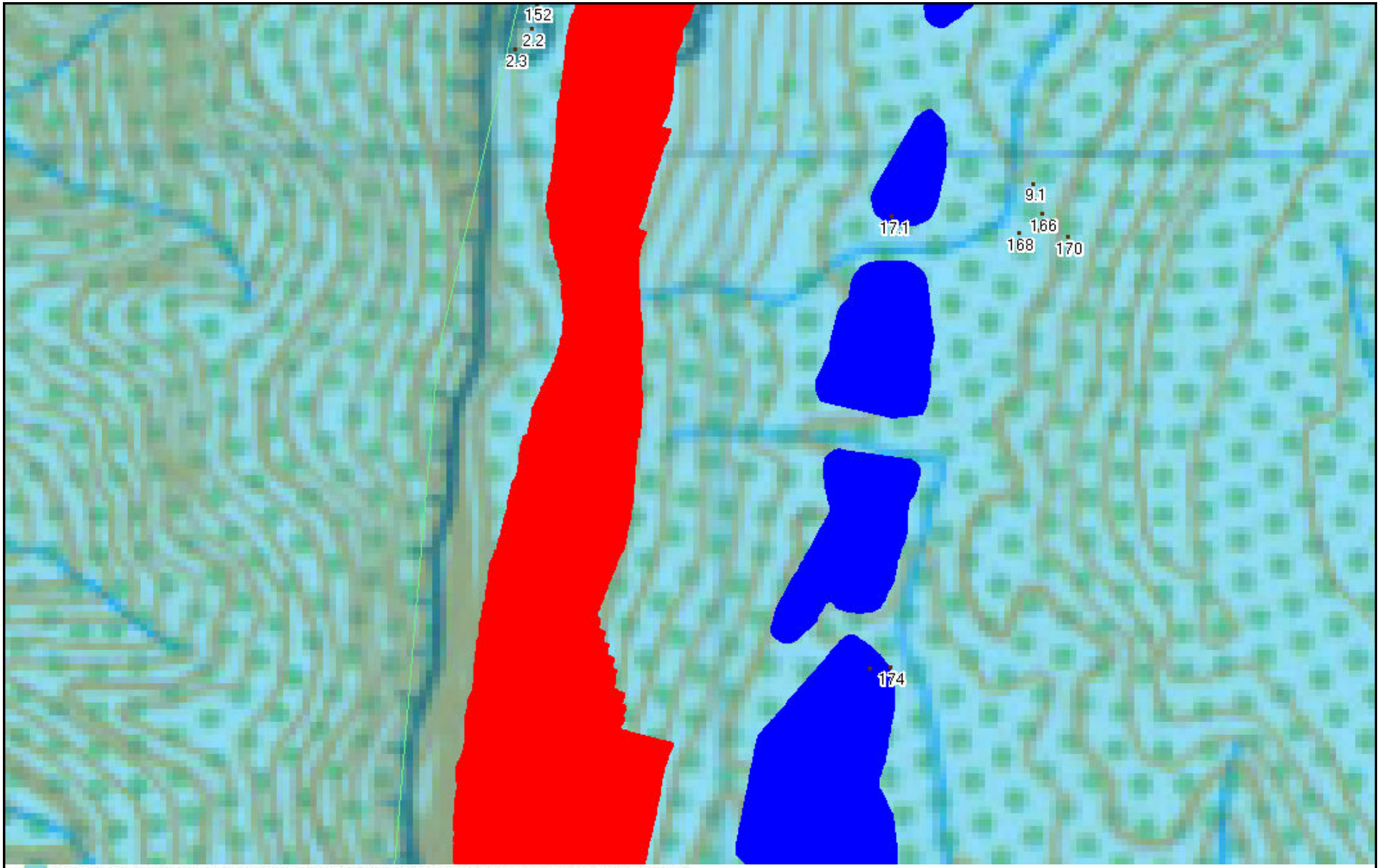
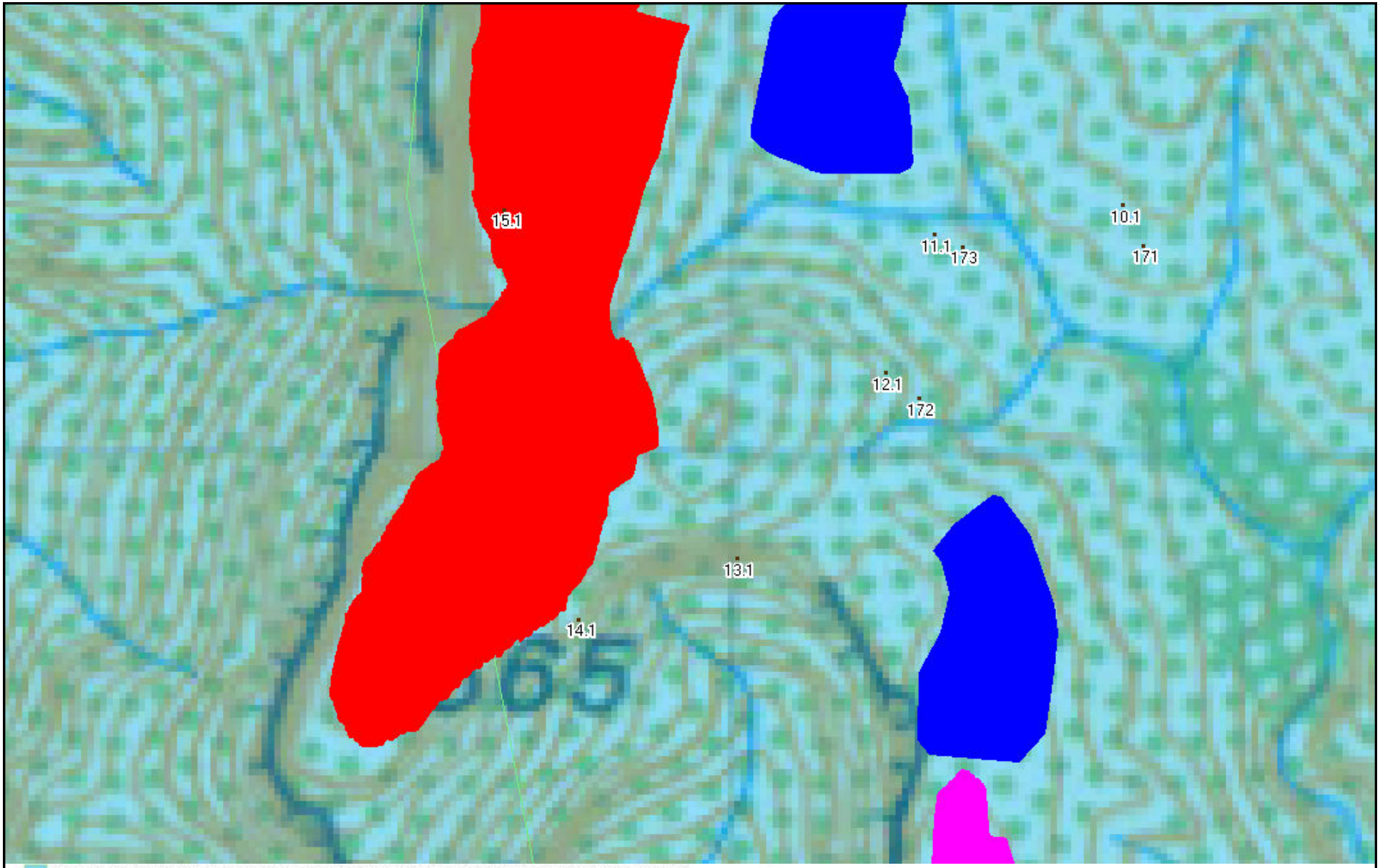
Auth: Mitch Ladyman	Project: Kimberley Metals Group RIOP	animal plant mineral	**Figure 1** **Tropical Savanna CRC Vegetation Mapping and RIOP Site in a Regional Setting** KMG RIOP
Date: April 2010	Datum: GDA94 (MGA Zone50)	NORTH	



Auth: Mitch Ladyman	Project: Kimberley Metals Group RIOP	animal plant mineral	**Figure 2a** **Tropical Savanna CRC Vegetation Mapping and Gouldian Finch Monitoring Sites** KMG RIOP
Date: April 2010	Datum: GDA94 (MGA Zone50)	NORTH	



Auth: Mitch Ladyman	Project: Kimberley Metals Group RIOP	animal plant mineral	**Figure 2b** **Tropical Savanna CRC Vegetation Mapping and Gouldian Finch Monitoring Sites** KMG RIOP
Date: April 2010	Datum: GDA94 (MGA Zone50)	NORTH	



Auth: Mitch Ladyman	Project: Kimberley Metals Group RIOP	animal plant mineral	**Figure 2c** **Tropical Savanna CRC Vegetation Mapping and Gouldian Finch Monitoring Sites** KMG RIOP
Date: April 2010	Datum: GDA94 (MGA Zone50)	NORTH	

Appendix 1 Survey field data

Site	WPs	Dominant Species	Number of Potential Nest Trees	Number of Potential Nest Sites	Measurements	Comments
Site 1	Riogou001		0	0		No suitable nest hollows found
Site 2	Riogou002 1stnesttree 2nd nesttree	*Eucalyptus tectifica* *Corymbia greeniana* *Corymbia dichromophloia*	3	4	1st nest hollow found in *Eucalyptus tectifica* 3.7m high from the ground Hollow 70mm in diameter North facing 2nd nest hollow in same tree 4.7m from ground 100mm in diameter North facing 3rd nest hollow in same tree 4.5m from ground 80mm in diameter North facing 4th nest hollow found in *Corymbia greeniana* 9.8m high from ground 60mm in diameter South facing	*Corymbia dichromophloia* - Smooth barked. This tree has two potential nest hollows but they are filled with termites. If the termites leave or get washed out the hollows could be used.

Site 3	Riogou003 WP 154	*Corymbia collina*	1	3	1st nest hollow found in *Corymbia collina* WP 154 4m from ground 50mm in diameter Hollow faces North West 2nd nest hollow in same tree 4.2m from ground 50mm in diameter Faces south 3rd potential nest hollow same tree Faces South East	The 3rd potential nest hollow in the same tree *Corymbia collina* faces South East. This hollow is unreachable as it is too high to get to, so there were no measurements were obtained
Site 4	Riogou004 WP 155 WP 156	*Corymbia collina*	2	3	*Corymbia collina* has two potential nest sites WP 155 *Corymbia collina* has one potential nest site WP 156 2.4m from ground 70mm in diameter North facing	The two potential nest hollows in the first *Corymbia collina* tree has two hollows unreachable as they are too high to get to, so no measurements were obtained
Site 5	Riogou005 WP 157 WP 158	*Corymbia collina*			*Corymbia collina* WP 157 Perfect nest hollow found 3.8m from the ground 45mm in diameter Facing east	Another *Corymbia collina* has potential future nest hollows if the termites leave and rain washes them out

					Corymbia collina WP 158 4.30meters from ground 35mm in diameter West facing	
Site 6	Riogou006 WP 159 WP 160 WP 161 WP 162	*Corymbia collina*			*Corymbia collina* WP 159 3.65m high 30mm in diameter Facing SSE 2nd nest hollow same tree 3.10m high 45mm in diameter North facing 3rd nest hollow same tree 3.31m high 30mm in diameter Facing east *Corymbia collina* WP 160 3.8m high 50mm in diameter Facing North *Corymbia collina* WP 161 2.7m high 40mm in diameter Facing South West	

					Corymbia collina WP 162 5.10 m high 50mm in diameter Facing SE	
Site 7	Riogou007	*Corymbia collina*				*Corymbia collina* has potential nest sites in hollows if the blockage clears. The hollows are blocked with termitaria – termite mounds.
Site 8	Riogou008 WP 163 WP 164 WP 165	*Eucalyptus brevifolia*			*Eucalyptus brevifolia* WP 163 2.20meters high 45mm in diameter South facing *Eucalyptus brevifolia* WP 164 3.40meters high 35mm in diameter South facing 2nd nest hollow same tree 2.50meters high from ground 35mm in diameter SW facing 3rd nest hollow same tree 3.10meters high 35mm in diameter East facing *Eucalyptus brevifolia* WP 165	This site has a lot of snappy gums – *Eucalyptus brevifolia*

					4.9 meters high 35mm in diameter North east facing	
Site 9	Riogou009 WP 166 WP 167 WP 168 WP 169 WP 170	*Eucalyptus brevifolia*	5	6	*Eucalyptus brevifolia* WP 166 2.2meters high 35mm in diameter NW facing *Eucalyptus brevifolia* WP 167 3.9meters high 60mm in diameter South facing *Eucalyptus brevifolia* WP 168 2.10meters high 50mm in diameter North facing 2nd nest hollow same tree 2.55meters high from the ground 30mm in diameter NW facing *Eucalyptus brevifolia* WP 169 3.35meters high 40mm in diameter East facing	

					Eucalyptus brevifolia WP 170 3.40meters high 35mm in diameter West facing	
Site 10	Riogou010 WP 171	*Eucalyptus jensenii* – Wandi ironbark			*Eucalyptus jensenii* WP 171 3.05meters from ground 50mm in diameter ENE facing	
Site 11	Riogou011 WP 173	*Eucalyptus brevifolia* – snappy gum			*Eucalyptus brevifolia* WP 173 Nest hollow 5.50meters high from ground 40mm in diameter North east facing	
Site 12	Riogou012	*Corymbia dichromophloia*	1	1	*Corymbia dichromophloia* WP 172 Unreachable nest hollow Approx 7meters high from ground Approx 60mm in diameter	*Corymbia dichromophloia* has an unreachable nest hollow that looks perfect with binoculars so we approximated the measurements
Site 13	Riogou013	*Eucalyptus jensenii* *Corymbia dichromophloia* *Corymbia collina*	0	0		All possible nest hollows found were blocked and not suitable. They may be suitable in the future if the blockage clears
Site 14	Riogou014		0	0		No suitable nest hollows found – some hollows were chocked with termites, others were bees nests

Site 15	Riogou015		0	0		No suitable nest sites found
Site 17	Riogou017		0	0		No suitable nest hollows were found – they were all blocked
Site 18	Riogou018 WP 174	*Eucalyptus brevifolia* – snappy gum	1	1	*Eucalyptus brevifolia* WP 174 Hollow 3.10 m high from ground 45mm in diameter North east facing	There were other possible nest sites in *Eucalyptus brevifolia* at this site that were full of termitaria and/or ants and the hollows from the tree limbs were quite split

Appendix 2: Survey site photos

Site 1

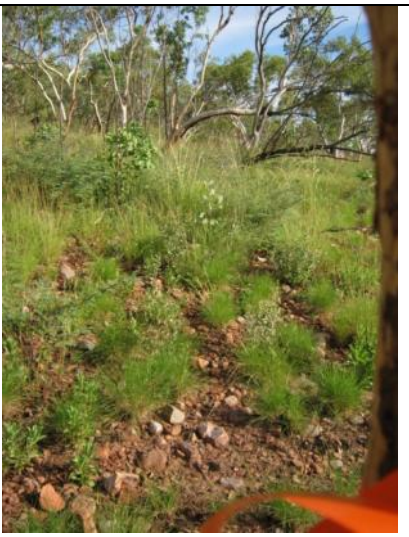
Site 2

Site 3

Site 4

Site 5

Site 6

 Site 7	 Site 8	 Site 9
 Site 10	 Site 11	 Site 12
 Site 13	 Site 14	 Site 15

 Site 17	 Site18	