

PLACE
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Ivanhoe Cloncurry Mine Leases and Associated Infrastructure

Baseline Ecological Report

Prepared for
Ivanhoe Cloncurry Mines Pty Ltd

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GLOSSARY, ACRONYMS & ABBREVIATIONS

Term	Definition
Arboreal	Living in a tree or trees
Biodiversity	The variety of all life forms, the genes they contain and the ecosystems and ecological processes they are part of
Bioregion	Broad landscape patterns that reflect major structural geologies and climate as well as major changes in floristic and faunistic assemblages
Connectivity	A behaviourally determined, species specific parameter, which depends on both landscape composition and movement ability and of animals; a parameter that measures the processes by which sub-populations in a landscape are interconnected
DERM	Department of Environment and Resource Management
Ecological Corridors	Retained and or restored systems of linear habitat, which at a minimum enhance the connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation (Wilson & Lindenmeyer 1995); A defined area of contiguous habitat that facilitates the dispersal of subpopulations throughout the landscape. Corridors may be structural, being identifiable physical/spatial features of habitat, and functional being a measure of whether a species can move between habitat patches (Bennett 1990).
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act (Commonwealth) 1999</i>
Fauna	Animals of a given region or period considered as a whole
Flora	The plants of a particular region, habitat or geological period (pl. floras or florae)
ha	Hectare
HERBRECS	Botanical database of the Queensland Herbarium
Investigation Site	Defined section of the ML (950 ha) subject to current surveys
km	Kilometre
LP Act	<i>Land Protection (Pest and Stock Route Management) Act (Qld) 2002</i>
m	Metre
mm	Millimetre
ML	Mining Lease
NC Act	<i>Nature Conservation Act (QLD) 1992</i>
NES	National Environmental Significance
PDG	PLACE Design Group
QLD	Queensland
RE	Regional Ecosystem; REs describe the relationship between vegetation communities in a particular bioregion that are consistently associated with a particular combination of geology, landform and soil
REDD	Regional Ecosystem Description Database
Terrestrial	Ground dwelling
Threatened Species	Species listed as critically <i>Endangered</i> , <i>Endangered</i> , <i>Vulnerable</i> in the <i>EPBC Act</i> or <i>Endangered</i> , <i>Vulnerable</i> and <i>Near Threatened</i> in the <i>NC Act</i> and Regulation
Vegetation Community	An assembly of different species of plants growing together in a particular habitat; the floral component of an ecosystem
VM Act	<i>Vegetation Management Act (Qld) 1999</i>

EXECUTIVE SUMMARY

In July 2010, Ivanhoe Cloncurry Mines (ICM) engaged PLACE Design Group (PDG) to identify the nature and extent to which the existing pool of literature assists in addressing environmental conditions imposed on ICM for the Selwyn Mine Area (SMA) by the Department of Environment and Resource Management (DERM). The purpose of the assessment was to identify the overall adequacy of the existing information in attending to the requirements laid out in the conditions.

Surveys were undertaken in detail on areas to be disturbed by Access Roads and Decline development, and regional scale surveys were undertaken on Mining Leases (MLs) to assess the potential occurrence of *Endangered* REs and flora and fauna in these areas. This information should facilitate management of low level disturbance in areas identified as not of concern.

PDG in liaison with ICM developed a scope of works which adequately covered all ICM's proposed disturbance and MLs. This report has been prepared to inform ICM of the potential for Species of Conservation Significance (SOCS) and threatened Regional Ecosystems (RE) which may occur throughout the Investigation Area.

PDG undertook a detailed vegetation community, flora, fauna and fauna habitat assessment (including fauna trapping) of the 10 ha Decline and Waste Dump Development. A similar detailed assessment of the vegetation communities, flora and fauna habitats, specifically concentrating on SOCS, was carried out along the proposed 15 km Access Road between Lucky Luke and Selwyn Mine.

Further to this, PDG undertook a preliminary assessment of vegetation communities and fauna habitats within all of the ICMs MLs. These assessments were focused on assessing the potential occurrence of SOCS and Of Concern / *Endangered* RE's within the ICM MLs.

The aforementioned surveys have been conducted during the mid-late dry season (15th-23rd of September 2010). Further survey works will be conducted post-wet season within and around those areas proposed for immediate disturbance (Decline Area and Access Road) to account for seasonal variation in both flora and fauna species.

Vegetation and Regional Ecosystems

Flora and Species of Conservation Significance

92 vascular plant species recorded across the Access Road and the Decline Area (no species censusing occurred within the ML groupings). This number is typical for a pre-wet season survey of this nature.

None of the flora species recorded during the field survey are listed under the *Nature Conservation Act (Qld) 1992* or the *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999*. From the analysis undertaken to date, it was determined unlikely that Species of Conservation Significance would occur either within the Access Road or the Decline or the ML.

Suitable habitat does exist within the broader area for a number of species of conservation significance, and while the trees and shrubs are easily detectable year-round, certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs are not readily detectable during the dry season. It is therefore recommended that post-wet season surveys are undertaken to assess the presence of Species of Conservation Significance and to bolster listings of flora species inconspicuous in the dry.

Weeds

Of the total 84 recorded flora species, 2 species, or 2.4%, are exotic species naturalised in Queensland. Neither of these species is declared under the schedules of the *Land Protection (Pest and Stockroute) Management Act (Qld) 2002*.

Regional Ecosystems

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation association over most of the area. It is often found in association with *Corymbia terminalis* (western bloodwood) and / or *Eucalyptus leucophylla* (Cloncurry box) which may become locally dominant. On the rocky upper slopes of the eastern fringe *Acacia cambagei* (gidgee) becomes the dominant species. A shrub layer of topography-dependent density is dominated by species of the genera *Acacia* and *Senna*. This strata varies from extremely sparse in the south-west plains, to sparse in the foothills and medium within the drainage lines. The seasonally depauperate ground layer is dominated by *Triodia molesta* (pincushion spinifex); apart from the western gibber plains which are dominated by indigenous species of *Poaceae*.

Most drainage lines are dominated by a narrow *Eucalyptus camaldulensis* (river red gum) woodland which has a typically sparse shrub layer dominated by *Acacia chisholmii* (Chisholm's wattle) and a ground layer dominated by the exotic species **Pennisetum ciliare* (buffel grass).

Six Regional Ecosystems RE1.3.7, RE1.5.3, RE1.10.4, RE1.11.2, RE1.11.3 and RE1.12.1 have been identified in the Investigation Area. All six have a management status under the *Vegetation Management Act (Qld) 1999* of *Least Concern*, the lowest conservation significance levels (greater than 30% of the pre-settlement RE remains).

Within the investigation Area, RE1.11.2 is represented by an additional four major vegetation communities recognised by the Queensland Herbarium (2009); RE1.11.2a, RE1.11.2e, RE1.11.2a and 1.11.2x2. These too have a management status of *Least Concern*.

Riparian areas present throughout the Investigation Area are aligned with RE1.3.7 "Red Gum (*Eucalyptus camaldulensis*) woodland on channels and levees (south)". This RE is found within the Access Road, and the Mount Elliott, Lady Ella, Mount Dore and Selwyn lease groups / lease areas, and has a Biodiversity Status of *Endangered*. Disturbance to this RE will be limited in relation to the extent of these areas throughout the region.

With the exception of RE1.3.7, the remaining REs have a biodiversity status of *No Concern at Present* which is the lowest significance level (greater than 30% of the pre-settlement RE remains).

None of these are considered threatened ecological communities at a national level under the *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999*.

RE1.3.7 is considered *Endangered* under DERM's biodiversity assessment on account of regional degradation of this RE by high total grazing pressure (direct impacts associated with trampling, secondary impacts associated with exotic pasture species introductions principally **Pennisetum ciliare* (buffel grass) and tertiary impacts associated with altered fire regimes (arising from buffel grass which carries a greater biomass than undisturbed systems) and habitat alteration). They also afford significant nesting and denning habitat for hollow dependent species, habitat for migratory waterbirds, and local and regional habitat connectivity opportunities. These areas are therefore considered to have the highest ecological value in the Investigation Area.

Natural examples of these systems do burn patchily due to low flammability and small fuel loads, however they should not be targeted for prescribed burning. This is

particularly pertinent for waterways containing **Pennisetum ciliare* (buffel grass) which significantly contributes to the fuel load and exacerbates the vulnerability of these areas to fire.

Key conclusions and recommendations are:

1. Minimisation of mining related impacts should be a focus of mine planning to limit the future disturbance of RE 1.3.7 where possible.
2. Post-wet season surveys are undertaken to assess the presence of Species of Conservation Significance and to bolster listings of flora species inconspicuous during the dry season.

Fauna and Habitats

Habitats of the Selwyn Ranges

The Selwyn Ranges are comprised of a mixture of ferruginous Proterozoic plateaux, colluvial plains, pediments and erosional plains. The climate of the region is semi-arid with a monsoonal wet season and distinct dry season. In general the major periods of rainfall occur between November and March (however draught is common). These conditions and geology have created a range of habitat types which consist largely of spinifex grasses, acacia shrubs and scattered low eucalyptus trees. . Habitat types and quality vary significantly across the region. These habitats provide a complex assortment of high to low quality habitats for a range of endemic fauna species. The major habitat types occurring through the region consist of vast undulating plains supporting a mixture of age cohort and densities of Spinifex grasses. These plains are regularly transacted by small colluvial/alluvial drainage lines and surrounded by steep metamorphic escarpments supporting a range of cave and crevice habitats. The higher quality habitats are generally aligned with areas that support a mixture of rocky escarpments with steeper sloping plains and larger incised drainage lines. These areas generally provide a greater source of denning, forage and connective habitat for all fauna groups.

The Investigation Area generally supports significant (low relief) north-south tending metamorphic ridges and plateaux with valley basins and drainage bisecting these ranges. The extensiveness of the overall Investigation Area incorporates different geologies, vegetation communities and subsequently provides a diverse matrix of quality habitat types. The diversity of habitat within the region supports an intricate balance of vegetation and habitat types which allow a substantial density of fauna to inhabit a relatively arid zone. Eleven major habitat types have been derived from within the Investigation Area, these being Rocky Escarpments; Caves; Higher Slope Gullies; Sloping Foothills; Rocky Knolls; Undulating Plains; Flat Plains; Riparian Channels; Lower Alluvial Drainage Lines; Dam Areas and Disturbance Areas.

Fauna and Species of Conservation Significance

101 vertebrate fauna were recorded across the Access Road and the Decline Area. A high proportion of these species are derived from the avifauna group which dominates the landscape. It is expected that many cryptic and seasonal migratory species were not detected, thus post wet season survey efforts may reveal a higher density of vertebrate fauna species utilising the investigation area than suggested by the present study.

The most recent recent survey efforts have identified a number species of conservation significance which are listed under the *Nature Conservation Act (Qld) 1992* or the *Environmental Protection and Biodiversity Conservation Act (C'wlth) 1999*.

These species consisted of *Petrogale purpureicollis* (purple-necked rock wallaby); *Taphozousroughtoni* (Troughtons sheath-tail bat); *Lophoictinia isura* (square-tailed kite) and *Falco hypoleucos* (grey falcon). The two mammals have specific roost and shelter / foraging habitat requirements met by the site. The two birds of prey are nomadic (grey

falcon) or occupy large home ranges (square tailed kite) of several hundred square kilometres.

A number of other species not recorded by the survey but which have been recorded previously on the site or in the region, and which are likely to have habitat requirements met within the Investigation Area include, *Heteromunia pectoralis* (pectorella manikin); *Melithreptus gularis* (black chinned honeyeater); and *Acanthopis antarcticus* (common death adder). Database searches and literature reviews also noted that *Sminthopsis douglasi* (Julia Creek dunnart) and *Macroderma gigas* (ghost bat) potentially occur within the region. The highly cryptic, nomadic habit of *Pezoporus occidentalis* (night parrot) dictates that this species could also occur.

Habitats across the Investigation do not provide areas of cracking clays and contiguous habitats required by the *Sminthopsis douglasi* (Julia Creek dunnart). It is highly unlikely that this species persists within the Investigation Area. No caves habitats that would support populations of *Macroderma gigas* (ghost bat) occur within the Investigation Area, however older redundant mine works outside of the Investigation Area may provide deep cave style habitat suitable for this species. It is however unlikely that this species persists within the Investigation Area given its noted population contraction in recent decades.

Petrogale purpureicollis (purple-necked rock wallaby) readily inhabits the Investigation Area. This species is dependent on rocky ridges and cave habitats (particularly eastern facing caves for basking purposes), which are common. Sub populations of this species have been observed within areas of high disturbance, most notably areas where large rock dumps have settled and created a network of caves and tunnels. These habitats are close to semi-permanent to permanent water sources and large areas of good forage habitat.

Taphozous troughtoni (Troughtons sheathtail bat) has been identified within the Investigation Area via the use of ANABAT echolocation technology call analysis. This species is considered *Endangered* under the *Nature Conservation Act (Qld) 1992*. Additionally, a population of this microchiropteran bat was noted roosting within an abandoned copper/gold mine and smelter (located within the Mt Elliot Mining Lease Group). These bat species have been tentatively identified via photograph interpretation as either *Taphozous troughtoni* (Troughtons sheathtail bat) or *Taphozous geogrossus* (common sheathtail bat). These species are very similar in physical appearance and are sympatric in the Mt Isa region.

Lophoictinia isura (square-tailed kite) and *Falco hypoleucos* (grey falcon) are diurnal raptor species with nomadic habits and extensive home ranges, respectively. These species were noted foraging over the Decline Area. Both species are noted as *Near Threatened* under the *Nature Conservation Act (Qld) 1992*. It is highly likely that both species use large portions of the Investigation Area as a part of a large home range which incorporates as matrix of habitat types. Raptors require larger remnant trees to nest in, which are generally common within the Investigation Area. Good forage habitat for all raptor species persists throughout the Investigation Area, in particular the higher ridge lines and dense vegetated riparian/drainage lines.

The *Near Threatened* *Heteromunia pectoralis* (pectorella manikin) and *Melithreptus gularis* (black chinned honeyeater) are passerine bird species and generally require a good density of ground and mid-strata vegetation for shelter and forage habitat. It is not likely that these species will be impacted by any proposed activities given the amount of habitat present within the Investigation Area.

Acanthopis antarcticus (common death adder) has been noted in previous surveys within the locality and anecdotally within the Selwyn Mining Camp. This species is listed as *Near Threatened* under the *Nature Conservation Act (Qld) 1992*. Habitat throughout the Investigation Area provides a suitable forage and movement habitat for this species and

it is likely to be relatively common due to the amount of habitat present and food resources occurring across the Investigation Area.

The *Endangered* nomadic *Pezoporus occidentalis* (night parrot) (*Environment Protection and Biodiversity Conservation Act (C'wlth) 1999*) has been identified by database searches as potentially occurring in the area as an arid specialist species. This species prefers dense lowland vegetation, primarily consisting of *Triodia spp.* (spinifex). The closest known record of the *Pezoporus occidentalis* (night parrot) is approximately 200 km south-east of the Investigation Area. Given previous impacts from cattle grazing and trampling suitable habitat coupled with the scarcity of confirmed records, it is considered unlikely that this species exist within the Investigation Area, however given its highly cryptic, nomadic nature, its presence cannot be definitively ruled out.

Key conclusions and recommendations are:

1. Avoid high quality ridgeline habitats. Where impacts are unavoidable and noted sub-populations of *Petrogale purpureicollis* (purple-necked rock wallaby) and *Taphozous troughtoni* (Troughtons sheath-tail bat) are known to occur, surveys to monitor cave habitat usage should occur.
2. Rock dumps occurring within the investigation Area should be inspected for the *Petrogale purpureicollis* (purple-necked rock wallaby). Should these areas require remediation it is recommended that works be conducted in a sequential manner to ensure the movement of all individuals out of the disturbance area. In order to provide ongoing habitat the retention or consideration of incorporating the larger rock boulder habitats for this species is recommended. Potential for the rehabilitation of these areas may provide a suitable habitat for a great many species inhabiting the Investigation Area.
3. Larger trees occurring within disturbance areas should be monitored for raptor usage and nests to avoid the loss of chicks or larger prominent nesting sites.
4. Remnant vegetation within riparian habitat areas should be inspected for hollow bearing limbs. These trees should be avoided due to the lack of hollows across the region as they play a large component of roosting and nesting habitat for birds such as parrot species and natural raptors.
5. It is recommended that for areas where vehicles operate (such as the Access Road and active mining leases) any fauna carcasses should be removed from access roads to a minimum of 20 metres from the road verge. This will avoid further fauna strike on scavenging species including raptors.

Responses to DERM Environmental Conditions

1. *The nature conservation value of all previously undisturbed areas less than 10 ha in area must be assessed through the internal permit system prior to disturbance.*

The company GIS should be populated with the regional level survey identifying the REs (in particular RE 1.3.7). Internal permits will be issued for all proposed disturbance under 10ha in scope, to limit disturbance to this RE. Permits will be conditioned to prevent disturbance of mature trees which may include nesting or foraging resources for native fauna. High quality ridgeline habitats will be preserved and surveys will be required in areas with cave habitats, prior to disturbance.

2. *The nature conservation values of undisturbed areas greater than 10 ha in area must be assessed prior to disturbance.*

Regional scale assessments of all proposed disturbance areas greater than 10ha will be possible once the post-wet season survey is complete, and all species and communities of concern within the locality are identified. Site specific surveys may be required in some key habitat areas as mentioned above. In particular, an

assessment is required of the impact any disturbance to the Mt Elliott heritage sites will have on any resident populations of *Taphozous troughtoni*. Additional historical workings that may also provide habitat for bat species will be managed appropriately, to avoid adverse impacts on any existing populations.

For the reasons of public and animal safety, redundant mine shafts may be sealed. Many of these shafts however are diurnal roost habitat for cave roosting micro-chiropteran (insectivorous) bats. It is unknown whether any maternity roost sites include these disused mine workings, however given that suitable roosts are often limiting resources in the landscape, they cannot be ruled out. Therefore any management leading to the sealing of shafts for safety purposes must be cognisant of bat presence and allow for some openings to remain to continue to facilitate continued bat use. This may include sealing the majority of the shafts and leaving a minor opening to allow bat egress and ingress; installing a collar over vertical shafts or providing a grate structure.

Alternatively bats may need to be actively removed if permanent sealing is required. This should occur during warmer months when the bats are active and have an opportunity to relocate roost; when the risk of juveniles remaining in caves awaiting the return of lactating feeding mothers (in the case of discovered maternity roosts) and immediately after dark when the majority of the bats have left for dusk feeding. Sealing should be followed by an active search to capture and release animals within the tunnels.

3. *Strategies to alleviate the immediate impact on nature conservation values.*

A number of strategies will be implemented to alleviate the impact of future development on existing nature conservation values, including:

- Limit disturbance to RE 1.3.7, including those mature trees within riparian areas that may contain high quality nesting habitats.
- Ensure minimal disturbance and further specific surveys are conducted in key fauna habitats such as ridgelines, caves, riparian areas and old mining structures;
- Removal of fauna carcasses from the access roads to avoid further fauna strike on scavenging species including raptors; and
- Inspect large rock dumps for the *Petrogale purpureicollis* (purple-necked rock wallaby) prior to disturbance, and implement sequential remediation to ensure the movement of all individuals out of the disturbance area. Further to this, ensure the retention or consideration of incorporating the larger rock boulder habitats into the local landscape for this species' continual use. The rehabilitation of these areas has the potential to provide a suitable habitat for a great many fauna species.

4. *Protection and recovery plans for any identified endangered or threatened ecological communities or species.*

Only one endangered ecological community has been recorded within the Investigation Area, RE 1.3.7. Disturbance to this community will be minimised as much as possible during future mining activities across the Investigation Area, and the dominant species known to occur in this community will be used in any revegetation works of disturbed riparian areas to ameliorate any unavoidable impacts.

5. *The area disturbed for mining and not rehabilitated within 12 months will be kept to a minimum.*

In all practicable instances, disturbed areas will be rehabilitated within 12 months of the cease of disturbance within those areas.

6. *A Weed Management Plan will be developed for the Investigation Area.*

No declared weed species have been identified within the Investigation Area. However, it is recommended that a weed management procedure be implemented for the operational phase of the development, to prevent the introduction of weed species as a result of increased traffic and the proliferation of weeds due to increased disturbance.

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1.0 INTRODUCTION

1.1 Background

In July 2010, Ivanhoe Cloncurry Mines (ICM) engaged PLACE Design Group (PDG) to identify the nature and extent to which the existing pool of literature assists in addressing environmental conditions imposed on ICM for the Selwyn Mine Area (SMA) by the Department of Environment and Resource Management (DERM). The purpose of the assessment was to identify the overall adequacy of the existing information in attending to the requirements laid out in the conditions.

It was determined that further survey of any areas designated for future disturbance was required to fulfil the conditions imposed by DERM, including:

1. The nature conservation value of all previously undisturbed areas less than 10 ha in area must be assessed through the internal permit system prior to disturbance;
2. The nature conservation values of undisturbed areas greater than 10 ha in area must be assessed prior to disturbance;
3. Strategies to alleviate the immediate impact on nature conservation values;
4. Protection and recovery plans for any identified endangered or threatened ecological communities or species;
5. The area disturbed for mining and not rehabilitated within 12 months must be kept to a minimum; and
6. A weed Management Plan must be developed for the project.

Surveys were undertaken in detail on areas to be disturbed by Access Roads and Decline development, and regional scale surveys were undertaken on Mining Lease Areas (ML) to assess the potential occurrence of *Endangered* REs and flora and fauna in these areas. This information should facilitate management of low level disturbance in areas identified as not of concern.

PDG in liaison with ICM developed a scope of works which adequately covered all ICM's proposed disturbance and MLs. This report has been prepared to inform ICM of the potential for Species of Conservation Significance (SOCS) and threatened Regional Ecosystems (RE) which may occur throughout the Investigation Area.

1.2 Scope

PDG undertook a detailed vegetation community, flora, fauna and fauna habitat assessment (including fauna trapping) of the 10 ha Decline and Waste Dump Development. A similar detailed assessment of the vegetation communities, flora and fauna habitats, specifically concentrating on SOCS, was carried out along the proposed 15 km Access Road between Lucky Luke and Selwyn Mine.

Further to this, PDG undertook a preliminary assessment of vegetation communities and fauna habitats within all of the ICM MLs. These assessments were focused on assessing the potential occurrence of SOCS and Of Concern / *Endangered* RE's within the ICM MLs.

1.3 Timing

The aforementioned surveys have been conducted during the mid-late dry season (15th-23rd of September 2010). Further survey works will be conducted post wet season to account for seasonal variation in both flora and fauna species.

1.4 Document Map

This Baseline Ecological Report is an overview and summation of the results of recent field assessments and species, habitat and vegetation predictive analysis for each ML and the immediate impact areas of the Access Road alignment and Decline Area (the Investigation Area). Major Regional Ecosystems have been mapped and noted within this part of the report as well as major habitat types. An analysis of threatened species and their likelihood has been provided. Recommendations for avoidance and amelioration of impacts have been noted within this part of the report.

Appendix A of this report contains a detailed assessment of each ML, the Access Road and the decline area and documents the pertinent findings and recommendations for each. All vegetation communities and habitat types present have been noted within this section.

2.0 REGIONAL SETTING

2.1 General

The Investigation Area is located in the Selwyn Ranges, approximately 140km south-east of Mt Isa, in north-west Queensland (**Figure 1**). Elements of the Investigation Area (18 MLs, proposed decline and waste rock dump and a 15 km Access Road) are outlined in **Figure 2**.

The MLs encompass a total area of approximately 45.27 km², comprising undisturbed areas of native vegetation, historical mining disturbance, current exploration workings and areas used for past and present cattle grazing.

The proposed Access Road is a 15 km, external extension of an existing internal Access Road (**Figure 2**) which extends from Mt Dore to Selwyn. The new road will comprise a 6m sealed road with a total width of 14 m. This Access Road will provide access between the Selwyn pit in the north to the Lucky Luke Mining Lease (Barrick Osborne) in the south where it will join an existing Access Road between the Lucky Luke Deposit and mineral processing facilities and Osborne Mine.

The Decline Area is situated within the southern half of the Mt Dore 1 Mining Lease Area (**Figure 2**) and comprises approximately 10 ha designated for the construction of a Decline Shaft, Waste Rock Dump, Sediment Dams, Drying Pads, Laydown Areas and associated infrastructure.

The Selwyn Ranges are predominantly comprised of low relief with colluvial plains, pediments and erosional plains associated with the Mort River and Mistake Creek catchments and dissected ferruginous Proterozoic plateaux (Wilford 2003). The area has a semi-arid, monsoonal climate with distinct wet and dry seasons. Most of the rainfall occurs in the summer months between November and March, although summer rainfall is unpredictable and droughts are common. The vegetation consists largely of spinifex, acacia shrubs and scattered low eucalyptus trees.

2.2 Vegetation and Regional Ecosystems

2.2.1 Regional Setting

The Investigation Area is located within the Mount Isa Inlier (Subregion 3) Province of the North West Highlands Bioregion (Bioregion 1), (Sattler and Williams - 1999). The Mount Isa Inlier is by far the largest province of the Northwest Highlands bioregion. It contains almost all the heavily folded sediments of the bioregion. Small areas of alluvium occur throughout. There are small areas of Mesozoic sediments of both the Carpentaria and Eromanga Basins capping some hills. Small outliers of Thornton province exist along its western margins. The province drains northward into the Gulf of Carpentaria via the Leichhardt and Cloncurry Rivers, and southwards into Lake Eyre, via tributaries of Georgina Creek and the Hamilton and Mort Rivers (**Figure 1**).

The predominant vegetation is low open woodland of *Eucalyptus leucophloia* (snappy gum) with *Corymbia spp.* (bloodwoods) and *Eucalyptus pruinosa* (silver-leaved box) over open-hummock grasslands (dominated by *Triodia spp.*). Areas of *Acacia cambagei* (gidgee) and *Corymbia spp.* (bloodwoods) with *Astrelba spp.* (Mitchell grasses) and **Pennisetum ciliare* (buffel grass) occur on sand and alluvial plains (Nelder, 1991).



Aerial Imagery: Google Earth Pro; Mining Lease Boundaries: The State of Queensland (DERM)

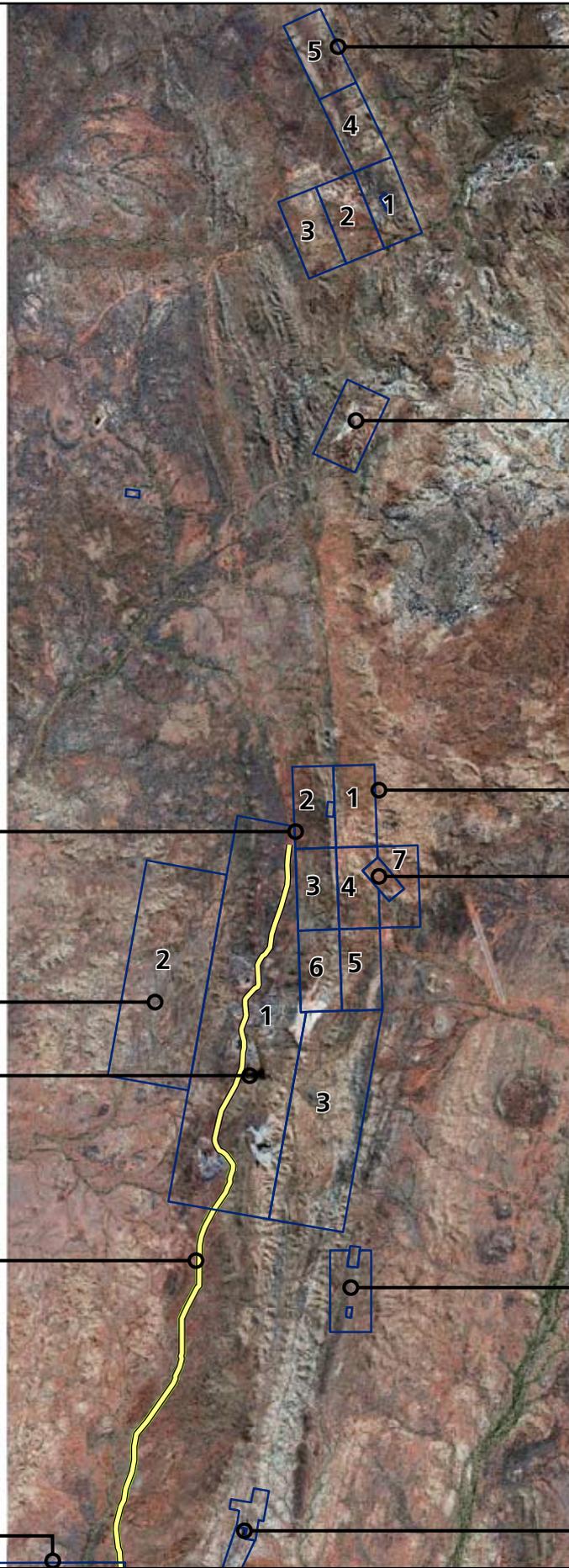


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FIGURE 1: INVESTIGATION SITE & LOCALITY

BASELINE ECOLOGICAL ASSESSMENT

DATE: 22/10/2010
 PROJECT NO: ICM02
 ISSUE: A
 SCALE: NTS



Mt Elliot (1-5)

Lady Ella

Mt Dore (1-7)

Marilyn

Mt Cobalt

Victoria

Decline Area

Selwyn (1-3)

Dam (Selwyn 1)

Access Road

Lucky Luke Mine

Aerial Imagery: supplied by Ivancorp; Mining Lease Boundaries: The State of Queensland (DERM)



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FIGURE 2:
PROPOSED DEVELOPMENT
 BASELINE ECOLOGICAL ASSESSMENT

DATE: 15/11/2010
 PROJECT NO: ICM02
 ISSUE: A
 SCALE: 1:25,000 @ A4

2.2.2 Land Zones

The Investigation Area is located within the North-West Highlands bioregion, which is defined as Bioregion 1 by Sattler and Williams (1999). With reference to available digital geological map sheets produced at a scale of 1:100,000, thirteen main soil types were geological identified as possibly occurring within the Investigation Area (**Table 1**). These soil types relate to 4 different landzones, as per the Vegetation Survey of Central Western Queensland (Neldner, 1991).

TABLE 1: GEOLOGICAL DESCRIPTIONS

Geological Code	Description	Period	Landzone
Mount Merlin 6954 and Selwyn 7054 1:100,000 Geological Map Sheets			
dl	Metadolerite, amphibolites.	Proterozoic	11
Jkg	Clayey quartz sandstone, some sublabile and glauconitic sandstone; minor ferruginised shale; locally bioturbated.	Mesozoic	10
Cz	Sand, silt, gravel: alluvial, colluvial and residual.	Cainozoic	5
PLiy	Non-porphyritic and porphyritic hornblende-biotite and biotite granite; minor aplite.	Proterozoic	12
PLgid	Non-porphyritic hornblende-biotite and biotite granite, minor aplite.	Proterozoic	12
PLka	Slate, phyllite, metasilstone, mica schist; minor feldspathic quartzite, chert.	Proterozoic	11
PLkr	Schist, meta-arenite, slate, phyllite, calc-silicate rocks, metarhyolite.	Proterozoic	11
PLkr/c	Thin bedded calc-silicate rocks; minor phyllite, slate, mica schist.	Proterozoic	11
Plkr/g	Interbedded schistose metagreywacke and mica schist commonly with porphyroblasts of andalusite + garnet + staurolite; minor quartzite, slate, calc-silicate rocks, hornfels	Proterozoic	11
PLkr/p	Phyllite, slate, mica schist.	Proterozoic	11
PLkr/q	Quartzite; minor schist, phyllite, slate.	Proterozoic	11
PLkr/s	Graphitic slate, phyllite and metasilstone; minor schist, calcareous rocks.	Proterozoic	11
Qz	Quartz vein.	Proterozoic	11

notes:

source: Queensland Geological Mapping (polygonised vector) Data, © The State of Queensland (Department of Mines and Energy) July 2008.

Land Zones: as described by Sattler and Williams (1999) and Nelder et al, (2005)

Owing to the scale of the geological mapping (1:100,000), and the small scale of the waterways present along the alignment, recent channel deposits and levees comprising active (stream) alluvium (Land Zone 3, *ibid*), which is confirmed by site survey as being present, is not mapped.

2.2.3 Vegetation

The Queensland Geological Mapping Data (July 2008) indicates that three geologies occur within the Investigation Area – undifferentiated alluvium/colluviums (Land Zones 3 and 5) and metamorphic rocks (Land Zone 11) of the Kuridala Formation. The topography of the Investigation Area is dominated by a number of linear metamorphic mountain ranges formed in a north to south alignment in the northern portions of the Selwyn Ranges. The southern portions of Investigation Area are consistent with gently undulating plains transected by numerous drainage lines flowing westerly into the Mort River.

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation association over most of the area. The shrub layer is dominated by species of the genera *Acacia* and

Senna although in the case of *Acacia* spp, these may dominate to form, woodlands, open forests or even closed forests. The seasonally depauperate ground layer is dominated by *Triodia molesta* (pincushion spinifex). In some drainage lines *Eucalyptus camaldulensis* (river red gum) is the dominant canopy species, with a shrub layer dominated by *Acacia chisholmii* (Chisholm's wattle) and a ground layer dominated by the exotic species *Pennisetum ciliare* (buffel grass). In smaller alluvial depressions the vegetation was dominated by *Acacia chisholmii* (Chisholm's wattle).

2.2.4 Habitats

The Selwyn Ranges are predominantly comprised of low relief with colluvial plains, pediments and erosional plains associated with the Mort River and Mistake Creek catchments and dissected ferruginous Proterozoic plateaux (Wilford 2003). The area has a semi-arid, monsoonal climate with distinct wet and dry seasons. Most of the rainfall occurs in the summer months between November and March, although summer rainfall is unpredictable and droughts are common. The vegetation consists largely of spinifex, acacia shrubs and scattered low eucalyptus trees. Habitat types and quality vary significantly across the region. These habitats provide a complex assortment of high to low quality habitats for a range of endemic fauna species. The major habitat types occurring through the region consist of vast undulating plains supporting a mixture of age cohort and densities of Spinifex grasses. These plains are regularly transacted by small colluvial/alluvial drainage lines and surrounded by steep metamorphic escarpments supporting a range of cave and crevice habitats. The higher quality habitats are generally aligned with areas that support a mixture of rocky escarpments with steeper sloping plains and larger incised drainage lines. These areas generally provide a greater source of denning, forage and connective habitat for all fauna groups.

2.3 Vegetation Communities and Species of Conservation Significance

2.3.1 Vegetation Communities

A review of existing literature and available databases has identified that one Threatened Ecological Community listed under the EPBC Act's Protected Matters of National Environmental Significance. This community is identified as *The Community of Native Species Dependent on Natural Discharge of Groundwater from the Great Artesian Basin*. It should be noted that these Ecological Communities are not associated with the North West Highlands Bioregion (Bioregion 1) in which the Investigation Area is situated. Database searches have picked up the potential occurrence of these Ecological Communities from surrounding bioregions proximate of the Investigation Area. One Regional Ecosystem occurring within the Investigation Area is noted as having a Biodiversity Management Status of *Endangered*.

2.3.2 Flora Species

A review of government databases coupled with a review of previous reports prepared for sites within the locality was conducted by PDG in 2010 (**Appendix B**). This review of existing literature encompassed a radius of approximately 100 km around the Investigation Area. It was noted that several records of threatened flora species protected under both the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Nature Conservation Act 1992* (NC Act). The likelihood of these species occurring within the Investigation Area is defined within **Table 2** along with their broad habitat requirements.

TABLE 2: FLORA SPECIES OF CONSERVATION SIGNIFICANCE KNOWN FROM THE REGION*

Species	Conservation Status ¹		Habitat/Recorded Location ²	Likelihood of Occurrence Within the Region
	NC Act ¹	EPBC ² Act		
<i>Acacia peuce</i>	V	V	Alluvial plains, gully drainage lines, slope or hills Goodwood (10km south of Bouilea); Boulia; Montague Downs (approximately 120km southwest of the Investigation Area).	Low
<i>Callistemon sp. Boulia</i>	V	V	This species occurs in tall open shrubland in stony soils and calcareous clays with high salinity. Known from 50–56 km east of Boulia. Occurs within the Desert Channels (Queensland) Natural Resource Management Region.	Low
<i>Cajanus lanuginosus</i>	NT	-	No information available on this species.	Moderate
<i>Eremophila tetraptera</i>	V	V	Slopes and in drainage hollows. Usually on clay soils but also recorded on sandy gravel. Known from the Diamantina River system in south-west Queensland and in the vicinity of Narcissus, Munduran, Cork and Old Cork Homesteads, about 130 km south-west of Winton.	Low
<i>Eriocaulon carsonii</i>	E	E	Found in aquatic environments associated with the Great Artesain Basin.	Low
<i>Goodenia angustifolia</i>	NT	-	Plains, gilgais, 7km south of Duchess (Approximately 100km to the north of the Investigation Area) 52km north of Bouilea (Approximately 77km to the west of the Investigation Area)	Moderate
<i>Ptilotus psuedohelipteroides</i>	NT	-	Plains, inland sand dunes, alluvial plains 51.9km north of Bouilea (Approximately 77km to the west of the Investigation Area); 20km west-south-west of Windsor Park (Approximately 120km to the south west of the Investigation Area)	Low
<i>Ptilotus remotiflorus</i>	NT	-	Habitats not noted in HERBRECS database Swords Range (Approximately 130km to the east of the Investigation Area)	Low
<i>Sclerolaena walkerii</i>	V	V	Plains, inland sand dunes Diamantina-Mackunda creek channels (Approximately 100km to the southeast of the Investigation Area)	Low

Notes

Source:

- *. Wildnet and Matters of NES Database

Status:

1. Endangered (E), Vulnerable (V), Near Threatened (NT); according to *Nature Conservation (Wildlife) Regulation 2006 (Qld)*
2. Endangered (E), Vulnerable (V); according to; *Environment Protection and Biodiversity Protection Act 1999*

2.4 Fauna

An assessment of habitat suitability was prepared for species of conservation significance that may occur in the locality. The primary focus of the assessment was to identify significant fauna issues in the context of potential disturbance of the Investigation Area and of sites in surrounding environments.

2.4.1 Database Investigations

A review of both Federal and State conservation databases was performed to provide an updated list of species that have been recorded or potentially occur within the locality. Data from Commonwealth and Queensland databases were collected for the area comprising a 100 km radius around the northern (Data Search Area: Latitude: 21.5342, Longitude: 140.495) and southern (Data Search Area: Latitude: 21.7778, Longitude: 140.4722) extents of the Investigation Area.

2.4.2 Commonwealth

The EPBC Act and Matters of National Environmental Significance Commonwealth database (**Appendix C**) identified one species of conservation significance (migratory bird species) (EPBC Act) which has a known geographic range/distribution that may overly the northern extent of the Investigation Area (**Table 3**). A further eight migratory bird species have been identified within this search. Searches for the southern extent of the Investigation Area identified three species of conservation significance which have known geographic ranges/distributions that may overly the area, including two migratory bird species (**Table 3**). A further eight migratory bird species have been identified within this search.

The Commonwealth's Biodiversity Group of Environment Australia (previously known as Australian National Parks and Wildlife Service) have prepared *The Action Plan for Australian Bats 1999* of which a noted species *Tahpozous troughtoni* (Troughton's sheath-tail bat) is listed as *Critically Endangered*. Currently this species does not have a listing under the EPBC Acts Matters of National Environmental Significance.

2.4.3 Queensland

The WildNet database searches (**Appendix D**) identified the presence of one species of conservation significance (NC Act) that has been recorded from within a 100 km radius of the northern and southern extents of the Investigation Area (**Table 3**). Prior to field assessment an analysis of each species range, habitat and dispersal requirements, habits and limiting resource requirements were identified. On the basis of these results a predictive analysis of species likely to be present was undertaken (confirmed presence, possible presence, unlikely presence) (**Table 3**), and targeted field survey methodologies were developed.

TABLE 3: FAUNA SPECIES OF CONSERVATION SIGNIFICANCE IDENTIFIED FROM THE REGION*

Name	Common Name	Record Source	Status		Potential or Confirmed Presence in region from past and current survey efforts
			C ^{with} ¹	Qld ²	
Reptiles					
<i>Acanthopis antarcticus</i>	common death adder	Fanning (1993); PDG (2006); AARC (2009)		NT	Confirmed
Birds					
<i>Falco hypoleucos</i>	grey falcon	Fanning (1993)		NT	Confirmed
<i>Melithreptus gularis</i>	black-chinned honeyeater	Fanning (1993); AARC (2009)		NT	Possible
<i>Lophoictinia isura</i>	square-tailed kite	Fanning (1993); AARC (2002); PDG (2010)		NT	Confirmed
<i>Heteromunia pectoralis</i>	pectorella mannikin	Fanning (1993); AARC (2002); PDG (2006); PDG (2010)		NT	Confirmed
Mammals					
<i>Petrogale purpureicollis</i>	purple-necked rock-wallaby	State (Queensland)		V	Confirmed
<i>Sminthopsis douglasi</i>	Julia creek dunnart	Commonwealth		E	Unlikely
<i>Taphozous troughtoni</i>	Troughton's sheath-tail bat	Fanning (1993)	E		Confirmed
<i>Macroderma gigas</i>	ghost bat	Fanning (1993)		V	Possible

Notes**Source:**

*. Wildnet and Matters of NES Database

1. **Commonwealth:** *Endangered (E)*, *Vulnerable (V)*, and *Near Threatened (R)*, according to the *Environment Protection and Biodiversity Conservation Act 1999*.
2. **State (Queensland):** *Endangered (E)*, *Vulnerable (V)* and *Near Threatened (NT)*, according to the *Nature Conservation (Wildlife) Regulation 2006*.

3.0 OVERVIEW OF RESULTS

3.1 Data Sources

A review of all existing information sources pertaining to the region was carried out to ascertain the potential constraints and environmental issues within the Investigation Area.

3.1.1 Methodology

The methodology for the vegetation survey included a review of existing information on flora of the region, as outlined in **Section 3.1.2**, and field surveys as described below.

The vegetation and habitats within the Investigation Area was systematically assessed between the 14th and 21st September 2010 by two PDG botanical and ecological staff. Intensive surveys focused on the Access Road and proposed Decline Area; however a rapid assessment of the vegetation and habitats occurring across the remainder of the Investigation Area was also undertaken. Detailed descriptions of the methods employed for each area are provided in **Appendix G**. Regional Ecosystems (and major vegetation communities recognised by the Queensland Herbarium (2009)) within both the Access Road and Decline Area were mapped via Differential GPS in conjunction with the defined geological mapping boundaries. Fauna habitats within the Access Road and Decline Area were investigated on foot and mapped utilising aerial photography interpretation. Habitat quality was determined on the basis of specific features being present (an analysis of the habitat types within the Investigation Area is provided within **Section 3.3**)

For the purpose of determining the status of Regional Ecosystems present within the Investigation Area, Regional Ecosystems were described in terms of the regional Ecosystems (RE) framework of Sattler and Williams (1999), with analogous RE's identified in the field with reference to Nelder et al, (2005) and the Regional Ecosystem Description Database (REDD) (Queensland Herbarium, 2009)¹. Status was confirmed with respect to the Management Status², Biodiversity Status³ (REDD) and Commonwealth EPBC Act listings.

3.1.2 Databases

Government Databases consulted consisted of the following:

- Department of Environment and Resource Management, Queensland Parks and Wildlife Service (2010), "Wildlife Online Extract".
- Department of Environment, Water, Heritage and the Arts (2010) "EPCB Act Protected Matters Report".
- HERBRECS Database (EPA, 2008).

Previous Reports

- AARC (2002), 'Lady Ella Flora and Fauna Report'. Prepared by Australasian Resource Consultants Pty LTD (AARC) for Selwyn Mines Pty LTD.
- AARC (2008), 'Cannington Life Extension – Initial Advice Statement'. Prepared by AARC for BHP Biliton Minerals Pty Ltd.
- AARC (2009), 'Cloncurry Copper Project – Purple-necked Wallaby Survey'. Prepared by AARC for Exco Resources Ltd.

1. Source:
http://www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems/how_to_download_redd.html
 2. With reference to the *Vegetation Management Act*
 3. DERM Biodiversity Planning Assessment

- AXM (2009), 'Flora and Fauna Assessment of Merlin Dewatering Dam Site, Selwyn Mine, Qld'. Prepared by AXM Environmental for Ivanhoe Cloncurry Mines.
- Elsol, J. (1994) 'BHP Minerals Cannington Project Vegetation and Flora Survey'. John Miedecke and Partners Pty Ltd.
- Fanning, D C (1993), 'Fauna Survey of the Osborne Project area'. Unpublished Report to Placer Pacific Pty. Ltd.
- PDG (2006), 'Flora and Fauna Study between the Trekelano Leases and the Duchess to Phosphate Hill Road'. Prepared by PLACE Environmental for Placer Dome Australia.
- PDG (2008), 'Lucky Luke Satellite Operation – Flora and Fauna Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.
- PDG (2010), 'Lucky Luke Satellite Operation – Ecological Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.
- PDG (2010), 'Ivanhoe Ecological Report Review and Gaps Analysis'. Prepared by PLACE Design Group for Ivanhoe Cloncurry Mines Pty Ltd.
- Queensland Government, State Development (2002), 'Selwyn Mines Expansion Project, Terms of Reference for an Environmental Impact Statement'. Selwyn Mines Limited.
- SRK (2010), 'Independent Technical Report on the Merlin Project Queensland'. Prepared by SRK Consulting for Ivanhoe Australia Ltd.

3.1.3 Analysis of Composite Data

Previous reports undertaken in the region were consulted to form a composite list of fauna species which have been recorded within the Investigation Area or in nearby localities (**Appendix E**). Results of this composite data analysis identify a total of 227 species of terrestrial vertebrate fauna. These comprise 5 species (3 families) of amphibians, 39 species (8 families) of reptiles, 142 species (51 families) of birds and 41 species (17 families) of mammals. These were used to inform the potential list of species of conservation significance.

An additional six species of conservation significance (NC Act) were identified within the Investigation Area or in nearby localities from past surveys (**Appendix E**). These include four *Near Threatened* and one *Vulnerable* state listed species (NC Act) and one *Endangered* Commonwealth listed species (EPBC Act) (**Table 3**).

It should be noted that the *Petrogale lateralis* (black-footed rock-wallaby) has been documented by two previous surveys throughout the locality, as well as within the most recent ecological gaps analysis (PDG 2010). Until recently it was thought that *Petrogale purpureicollis* (purple-necked rock-wallaby) was a sub-species (previously *Petrogale lateralis purpureicollis*); however recent taxonomic revisions identified this as a separate species. As a result the *Petrogale lateralis* (black-footed rock-wallaby) is not considered to exist in the locality, with records found only west of the Northern Territory.

3.2 Field Survey Results and Discussion

3.2.1.1 Species

A combined total of 93 vascular plant species have been recorded in the overall Investigation Area (**Appendix F**).

3.2.1.2 Exotic and Declared Species

Of the 93 vascular plants recorded in the Investigation Area, 2 species, or 2.2%, are exotic species naturalised in Queensland (being **Pennisetum ciliare* (buffel grass) and *Bidens bipinnata* (beggars tick)). None of the species are declared weeds under the schedules of the LP Act.

3.2.1.3 Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealths EPBC Act, no species of conservation significance were recorded from within the Investigation Area.

An assessment of the habitat requirements of potentially occurring threatened species in **Table 2** lists two further species listed under the NC Act as having a "moderate" likelihood of occurring in the Investigation Area, based on the existence of suitable habitat. *Cajanus lanuginosus* is a readily distinguishable woody plant and was not recorded within the Investigation Area. *Goodenia angustifolia* may be harder to detect, however due to higher than average rainfall in the months preceding the survey the likelihood of its being detected if present was significantly increased. Surveys were performed within the preferred habitat of this species but it was also not recorded within the Investigation Area.

3.2.1.4 Regional Ecosystems and Ecological Communities

In a broad sense, the topography within the Investigation Area can be described as undulating plains, low rises and rocky ridges intersected by intermittent streams, flowing from dissected low residuals and rolling hills. The vegetation is comprised of low open woodland, hummock grassland and riparian woodland, variously affected by mining and grazing disturbance. **Plates 1 - 6** show representative images of the Investigation Area's characteristics.

Six Regional Ecosystems have been identified in the Investigation Area (**Table 4**). All six have a management status of *Least Concern*, the lowest conservation significance levels (greater than 30% of the pre-settlement RE remains).

Riparian areas present throughout the Investigation Area are aligned with RE1.3.7 "Red Gum (*Eucalyptus camaldulensis*) woodland on channels and levees (south)". This RE is found within the Access Road, and the Mount Elliott, Lady Ella, Mount Dore and Selwyn lease groups / lease areas, and has a Biodiversity Status of *Endangered* (**Table 4**).

With the exception of RE1.3.7, the remaining REs have a biodiversity status of *No Concern at Present* which is the lowest significance level (greater than 30% of the pre-settlement RE remains).

Within the Investigation Area, RE1.11.2 is represented by an additional four major vegetation communities recognised by the Queensland Herbarium (2009).

Table 5 identifies the RE's present within each of the elements of the Investigation Area.

TABLE 4: EQUIVALENCY AND STATUS OF REGIONAL ECOSYSTEMS RECORDED IN THE INVESTIGATION AREA

RE	Status		Regional Ecosystem Description
	Management Status	Biodiversity Status	
1.3.7	Least Concern	Endangered	Eucalyptus camaldulensis (river red gum) woodland on channels and levees in south of bioregion: Fringing woodland of <i>Eucalyptus camaldulensis</i> (river red gum), with <i>Melaleuca bracteata</i> (black tea-tree) on levees of smaller channels and <i>Melaleuca argentea</i> (silver-leaved paper bark) on those of larger ones. <i>Lophostemon grandiflorus</i> (northern swamp mahogany) usually present, occasional <i>Terminalia aridicola</i> (arid peach). <i>Eucalyptus microtheca</i> (flooded box) or <i>Eucalyptus leucophylla</i> (Cloncurry box) on finer textured soils. <i>Melaleuca leucadendra</i> (cajuput tree) may dominate creek lines where water is available for extended periods each year. Occurs on recent levees and channel deposits of larger tributaries; alluvial soils.
1.5.3	Least Concern	No Concern at Present	Eucalyptus leucophloia (snappy gum) low open-woodland on red earths on plateaus: <i>Eucalyptus leucophloia</i> (snappy gum) low open-woodland and woodland sometimes with shrubby understorey dominated by <i>Acacia spp</i> (wattles). Usually <i>Triodia spp</i> (spinifex grass) dominated ground cover. Includes areas of <i>Corymbia terminalis</i> (western bloodwood) woodland. Occurs on undulating plateau surfaces with occasional low mesas; lateritic red earths, and small areas of shallow sandy loams and skeletal soils.
1.10.4	Least Concern	No Concern at Present	Eucalyptus leucophloia (snappy gum) and/ or Acacia spp. low open woodland on stony sandstone plateaus: Low open-woodland of <i>Eucalyptus leucophloia</i> (snappy gum). <i>Acacia spp</i> (wattles) usually prominent, forming shrublands in the far south. Ground cover of <i>Triodia spp</i> (spinifex grass) and annual grasses. Occurs on residual plateaus and scarps on near horizontally bedded sandstones and conglomerates; skeletal soils.
1.11.2	Least Concern	No Concern at Present	Eucalyptus leucophloia (snappy gum) low open-woodland: <i>Eucalyptus leucophloia</i> (snappy gum) low open-woodland or low woodland, sometimes with <i>Eucalyptus leucophylla</i> (Cloncurry box) usually with an <i>Acacia spp</i> (wattle) dominated shrub layer and <i>Triodia spp</i> (spinifex) and/or tussock grass understorey. Treeless areas common. Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths.
1.11.2a	Least Concern	No Concern at Present	Eucalyptus leucophloia (snappy gum) low open-woodland: low open woodland of <i>Eucalyptus leucophloia</i> (snappy gum) often with <i>Corymbia spp.</i> (bloodwoods), <i>Terminalia aridicola</i> (desert peach) and <i>Eucalyptus leucophylla</i> (Cloncurry box) with shrub layer of <i>Acacia spp.</i> (wattles) and ground layer of <i>Triodia spp</i> (spinifex) occurring on steep hills and strike ridges
1.11.2e	Least Concern	No Concern at Present	Eucalyptus leucophylla (Cloncurry box) and Eucalyptus leucophloia (snappy gum) low open-woodland: Low open-woodland of <i>Eucalyptus leucophylla</i> (Cloncurry box) and <i>Eucalyptus leucophloia</i> (snappy gum) often with <i>Acacia cambagei</i> (gidgee) and <i>Corymbia terminalis</i> (western bloodwood) with a sparse ground layer of <i>Triodia pungens</i> (pin-cushion spinifex) and/or <i>Triodia longiceps</i> (pincushion spinifex). Occurs on footslopes and lower slopes, broken by creeks and drainages
1.11.2x2	Least Concern	No Concern at Present	Acacia cambagei (gidgee) low woodland: <i>Acacia cambagei</i> (gidgee) dominated low woodland on hills and ranges of fine grained metamorphic sediments.
1.11.2x2a	Least Concern	No Concern at Present	Acacia shirleyi (lancewood) low woodland to open-forest on metamorphic hills: low open woodland to open forest of <i>Acacia shirleyi</i> (lancewood) on metamorphic hills
1.11.3	Least Concern	No Concern at Present	Corymbia terminalis (western bloodwood) low open-woodland: Low open-woodland of <i>Corymbia terminalis</i> (western bloodwood) usually with <i>Eucalyptus leucophylla</i> (Cloncurry box) or <i>Eucalyptus leucophloia</i> (snappy gum) with <i>Acacia spp</i> (wattle) dominated shrub layer and ground layer of <i>Triodia spp</i> (Spinifex grass) and/or tussock grasses. Includes areas of <i>Acacia spp</i> (wattle) shrubland and <i>Triodia spp</i> (Spinifex grass) grassland. Occurs on metabasalts and dolerites; skeletal soils, some shallow loams.
1.12.1	Least Concern	No Concern at Present	Eucalyptus leucophloia (snappy gum) low open-woodland on granites: low open-woodland of <i>Eucalyptus leucophloia</i> (snappy gum), sometimes with <i>Eucalyptus leucophylla</i> (Cloncurry box), <i>Corymbia terminalis</i> (western bloodwood) or <i>Corymbia aparrerinja</i> (ghost gum) with an <i>Acacia spp</i> (wattle) dominated shrub layer and <i>Triodia spp</i> (spinifex grass) dominated ground layer. Includes areas of treeless <i>Triodia spp</i> (Spinifex grass) grasslands and <i>Acacia spp</i> (wattle) shrublands. Occurs on ranges and stony hills and rises on igneous rocks; skeletal soils and some shallow red earths.

Note:

Management Status: Status under the *Vegetation Management Act*

Biodiversity Status: DERM's biodiversity status which is used for a range of planning and management applications including the Biodiversity Planning Assessment (a state wide assessment of natural resources), and to determine environmentally sensitive areas that are used for regulation of the mining industry through provisions in the *Environmental Protection Act 1994*.

TABLE 5: REGIONAL ECOSYSTEMS PRESENT WITHIN EACH MINING LEASE GROUP

ML GROUP	REGIONAL ECOSYSTEMS									
	1.3.7	1.5.3	1.10.4	1.11.2	1.11.2a	1.11.2e	1.11.2x2	1.11.2x2a	1.11.3	1.12.1
Access Road	✓	✓				✓				
Decline Area		✓			✓		✓			
Mount Elliott	✓	✓	✓	✓				✓		
Lady Ella	✓		✓	✓				✓		
Mount Dore	✓	✓		✓						✓
Selwyn	✓	✓		✓						✓
Mount Cobalt		✓							✓	
Victoria				✓						✓



RE 1.3.7 *Eucalyptus camaldulensis* (river red gum) woodland



RE 1.5.3 *Eucalyptus leucophloia* (snappy gum) low open woodland



RE 1.10.4 *Eucalyptus leucophloia* (snappy gum) low open woodland



RE 1.10.5 *Acacia shirleyi* (lancewood) open forest



RE 1.11.2 *Eucalyptus leucophloia* (snappy gum) low open woodland



RE 1.12.1 *Eucalyptus leucophloia* (snappy gum) low open woodland



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PLATES 1-6: INVESTIGATION AREA CHARACTERISTICS BASELINE ECOLOGICAL REPORT

DATE: 17/10/10
PROJECT NO: ICM02
DWG NO./ISSUE: ICM02_SK01
NTS

3.3 Fauna and Habitats

The primary aim of the survey efforts was to assess the potential impacts of the proposed mining activities on fauna that are confirmed or likely to be present within the Investigation Area. Survey efforts targeted, but were not limited to, the potential presence of fauna species listed under relevant Commonwealth (EPBC Act) and Queensland (NC Act) legislation. Defining the extent and quality of habitats across the Investigation Area and surrounding region provides an indication for the potential faunal assemblages likely to occur.

Habitats assessments were qualified based on the presence of the following habitat features:

- Vegetation cover and structure;
- Size and range of arboreal and terrestrial hollows;
- Rocky outcrops, overhangs, crevices and caves ;
- Freestanding water bodies, ephemeral drainage or seepage areas;
- Disturbances including weed incursion, clearing and/or inappropriate fire regimes;
- Connectivity to offsite habitats; and
- Surrounding habitats.

The quality of habitat persisting within the Investigation Area was assessed based on several criteria which are outlined within **Table 6**.

TABLE 6: HABITAT QUALITY ASSESSMENT

Rating	Description of Habitat
Low	Many fauna habitat elements in low quality areas have been removed or altered such as mature, hollow bearing trees, fallen timber and deep leaf litter. For terrestrial habitats remnants are often small in size, support substantial weed infestations and are poorly connected to other areas of remnant vegetation. For aquatic habitats these may be waterways that have been de-nagged and riparian vegetation removed, or constructed drains.
Moderate	Some habitat components are present but others are lacking. For terrestrial habitats an example is remnant may have a reasonably intact understorey but lack fallen timber and hollow bearing trees. Linkages with other remnant habitats in the landscape may be lacking or somewhat tenuous. For aquatic habitats these may be semi-natural streams (including artificial channels and wetlands) with varying degrees of overhanging and in-stream vegetation with some snags and connectivity.
High	Most habitat components are present. For terrestrial habitats, habitats with old-growth trees, fallen timber, lack of weeds, the remnant is large enough to support forest dependant species and is well connected or contiguous with other areas of native vegetation. Habitat features such as rocky outcrops, steep jumps and areas supporting caves provide significant habitat features for a great many fauna species persisting within arid areas. For aquatic habitats these are natural water bodies (or water bodies designed along natural ecological functioning principles) with a high degree of in-stream and riparian features and good connectivity.

3.3.1 Habitats of Study Area

Prior to non-indigenous settlement this area would have supported a more diverse habitat structure, with floristically diverse, intact understoreys containing fallen timber and a greater variance in *Spinifex* age cohorts and densities. Older contiguous environments without disturbance would have permitted relatively uninhibited interaction between species populations. The age composition of vegetation across the Investigation Area would have supported a denser canopy and understorey enabling a broader range of small bird and mammal species to persist throughout the Investigation Area. Since settlement the Investigation Area has been subject to a variety of clearing intensities (as have surrounding properties) from disturbed areas void of vegetation due to mining activities through to remnant riparian and mountainous ridgelines.

The extensiveness of the Investigation Area incorporates different geologies, Regional Ecosystems and subsequently provides a matrix of quality habitat types. For the most

part the habitat in the Investigation Area incorporates folded metamorphic mountain ranges presenting linear rocky ridgelines coupled with large undulating plains and valley basins. The diversity of habitat within the region supports an intricate balance of vegetation and habitat types which allow a substantial density of fauna to inhabit a relatively arid zone. A detailed description of all the habitat types identified during recent survey efforts is provided within **Section 4.3**

Prior to field assessment, habitats present in the Investigation Area were determined from desktop analysis of mapped Regional Ecosystems and vegetation communities. These habitats were validated during field survey and subjected to a variety of sampling techniques to identify component fauna.

3.3.2 Fauna Survey Methodology

Fauna field surveys were conducted from the 15th – 23rd September 2010. The purpose of these surveys were to document as many of the fauna species (mammals, birds, reptiles and amphibians) that occur on the site as possible, as well as identify and note any incidental observations of fauna habitat and evidence of fauna presence (e.g. scat collection, trunk scratching). Full details of the sampling and survey methodology, and noted limitations are outlined in **Appendix G**. A detailed breakdown of daily weather conditions for September 2010 is provided in **Appendix H**.

3.3.3 Habitats of the Study Area

Habitats types are described in detail within **Table 7**. Within the Investigation Area, nine vegetation communities have been identified and remain relatively common throughout the locality. These vegetation associations can be broadly grouped in to six habitat types, which include the following:

1. Rocky escarpments;
2. Caves;
3. Higher slope gullies;
4. Sloping Foothills;
5. Rocky knolls;
6. Undulating plains;
7. Flat plains;
8. Riparian channels;
9. Lower alluvial drainage lines;
10. Dam areas; and
11. Disturbance areas

All eleven habitat types could be further broken down into individual types based on subtle differences, however this was not deemed necessary given the occurrence of key habitat features within similar habitat types. Each habitat type was sampled as a part of the survey efforts. The breakdown of habitat types occurring within specific ML's is summarised within **Table 8**.

TABLE 7: FAUNA HABITAT TYPE DESCRIPTIONS

Habitat Type	Habitat Reference	Description	Habitat Quality*
Rocky Escarpments	1	Higher rocky ridge lines containing small to large rock piles and crevices. Areas comprise sparse <i>Triodia molesta</i> (pincushion spinifex) groundcover on rocky surfaces with very sporadic canopy of <i>Eucalyptus leucophloia</i> (snappy gum) and occasional stand of <i>Acacia cambagei</i> (gidgee).	High
Caves	2	High and steep rocky ridge lines containing shallow and moderately deep caves.	High
Higher slope gullies	3	Eroded gullies within the steeper foothills containing rocky incised banks and crevices. Primarily contain large rocky incised banks with a moderately dense cover of <i>Triodia molesta</i> (pincushion spinifex) and/or <i>Acacia chisholmii</i> (Chisholm’s wattle). Occasional <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood) trees present; however for the most part taller canopy trees are usually absent.	Moderate - High
Sloping Foothills	4	Steep foothills containing a sparse canopy of <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood). Generally comprised of a denser groundcover dominated by medium sized <i>Triodia molesta</i> (pincushion spinifex). Areas can be dominated by dense clumps of <i>Acacia chisholmii</i> (Chisholm’s wattle) and/or <i>Acacia cambagei</i> (gidgee) with a sparse groundcover.	Moderate
Rocky knolls	5	Small knolls of exposed rocky outcrops supporting small crevices similar to rocky escarpments. Generally exposed metamorphic rock surrounded by moderately sloping foot hills with a sparse <i>Triodia molesta</i> (pincushion spinifex) ground cover and a sporadic to sparse <i>Eucalyptus leucophloia</i> (snappy gum) and/or <i>Acacia chisholmii</i> (Chisholm’s wattle) canopy.	Moderate
Undulating plains	6	Dominated by slightly undulating hills containing moderately dense ground covers of small to medium <i>Triodia molesta</i> (pincushion spinifex) clumps on rocky surfaces. Occasional areas dominated by stands of <i>Acacia chilsomii</i> (Chisholm’s Wattle). Canopy is predominately sparse comprising <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood).	Moderate - Low
Flat plains	7	The lower stony flats and plains provide little habitat structure, with numerous cleared patches of red soil and very little canopy cover. These areas are primarily dominated by <i>Aristida contorta</i> (bunched kerosene grass) and sparse <i>Triodia molesta</i> (pincushion spinifex) clumps on very stony soils. Very little to no canopy vegetation present.	Low
Riparian channels	8	These habitats are generally dominated by sporadic mature <i>Eucalyptus camaldulensis</i> (river red gum) reaching a height of 8 - 15 m. The shrub layer consists of sparse <i>Acacia chilsomii</i> (Chisholm’s Wattle) and <i>Acacia cambagei</i> (gidgee) with a dense groundcover of <i>Triodia molesta</i> (pincushion spinifex) and fallen branches. Soil is generally coarse alluvium and clay.	High
Lower alluvial drainage lines	9	Dominated by medium to large <i>Triodia molesta</i> (pincushion spinifex) clumps with occasional stands of dense <i>Acacia chilsomii</i> (Chisholm’s Wattle) or <i>Eucalyptus normantonensis</i> (Normanton box). Contains sparse canopy species in areas comprising of <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood). Soils vary from areas of fine sands to areas containing small stones and pebbles (colluvial).	Moderate - high
Dam areas	10	Areas containing permanent freshwater sources. Generally surrounded by a canopy of <i>Eucalyptus camaldulensis</i> (river red gum) and little ground cover. Often associated with past mining activities.	High
Disturbance areas	11	These areas are typically void of vegetation as result of current and past anthropogenic activities. These include access roads, mining pits, operational structures, waist rock piles, and sedimentary dams. Some Disturbance areas provided moderate quality habitat for specific fauna species.	Moderate – Low

Notes:

*: refer to Table 6 – Habitat Quality Assessment for details of rating criteria

TABLE 8: FAUNA HABITAT TYPES PRESENT WITHIN EACH MINING LEASE GROUP

ML GROUP	HABITAT TYPE										
	1	2	3	4	5	6	7	8	9	10	11
Access Road						✓	✓	✓	✓		✓
Decline Area	✓		✓	✓	✓	✓	✓	✓	✓		✓
Mt Elliott	✓	✓	✓		✓	✓	✓	✓	✓		✓
Lady Ella	✓	✓	✓			✓			✓		✓
Mt Dore	✓	✓	✓			✓	✓	✓	✓		✓
Selwyn	✓	✓	✓	✓		✓			✓	✓	✓
Mt Cobalt	✓	✓	✓	✓	✓	✓	✓		✓		✓
Victoria					✓	✓			✓	✓	✓

3.3.4 Number of Species Recorded

During the most recent fauna survey 101 fauna species were recorded. These species included 8 species (3 families) of reptiles, 72 species (29 families) of birds, and 21 species (8 families) of mammals (**Appendix I**). No amphibian species were recorded during survey efforts. Amphibian species have been previously recorded within the Investigation Area. The absence of amphibian species during this survey effort can be attributed to the surveys timing (dry season).

Three state listed species of conservation significance (NC Act) were identified within the Investigation Area during the assessment. These species include the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby), *Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite). The *Heteromunia pectoralis* (pectorella manikin) (NC Act) has also been confirmed within the Investigation Area (AARC 2002; PDG 2010). PDG (2010) found this species regularly foraging within the Mort River corridor.

Two migratory species (EPBC Act), *Merops ornatus* (rainbow bee-eater) and *Egretta alba* (great egret) were identified within the Investigation Area during recent surveys. A further two migratory species have been confirmed within the Investigation Area during past surveys: *Apus pacificus* (fork-tailed swift) (AXM 2009), *Ardea ibis* (cattle egret) (AARC 2002)

3.3.5 Species of Conservation Significance and Habitats

Seven species of conservation significance (NC Act) have been confirmed or identified as potentially occurring within the Investigation Area or the surrounding locality (**Appendix E**). Four of these species were recorded during recent surveys. An analysis of each species and their habitat requirements is provided within **Appendix L**.

The *Vulnerable Lophoictinia isura* (square-tailed kite) and *Falco hypoleucos* (grey falcon) (NC Act) were recorded in the Investigation Area during recent surveys. The *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby) was recorded in three locations throughout the Investigation Area. Two sites within the Selwyn 1 ML were identified as disturbed rock dumps created by previous mining overburden. *Petrogale purpureicollis* (purple-necked rock-wallaby) was also confirmed in natural habitat areas (Selwyn 3 ML) following scat analysis by expert Barbara Triggs (**Appendix J**).

Analysis of recorded bat calls revealed the probable existence *Endangered Taphozous troughtonii* (Troughton's sheath-tail bat) (NC Act) existing within the Investigation Area (**Appendix K**). It is considered highly likely that this species exists within the Investigation Area due to the abundance of shallow caves and abandoned mine shafts and structures present which provide preferred roosting habitat. It should be noted that the Biodiversity Group of Environment Australia, through the Endangered Species Program (ESP) has developed *The Action Plan for Australian Bats*⁴.

Other species of conservation significance targeted during recent surveys included *Vulnerable Macroderma gigas* (ghost bat) (NC Act), *Endangered Zyzomys palatalis* (carpentaria rock-rat) (EPBC Act) and *Endangered Sminthopsis douglasi* (Julia creek dunnart) (EPBC Act). These species have been identified as potentially occurring within the locality. Specific habitat searches and surveys were conducted for each species. These species are considered below.

The *Vulnerable Macroderma gigas* (ghost bat) listed as *Vulnerable* under the NC Act, was not detected during any recent survey efforts. This species prefers rocky outcrops containing deep caves for roosting habitat. This species may potentially utilise the

⁴ *The Action Plan for Australian Bats* and can be found on the following address:
<http://www.environment.gov.au/biodiversity/threatened/publications/action/bats/index.html>

Investigation Area as a part of a broader forage home range, however recent surveys failed to find any suitable deep roosting caves, nor did echolocation survey efforts record this species. This species has also undergone a contraction in its range, predominately restricting it to tropical north Australia.

The *Endangered Zyzomys palatalis* (carpentaria rock-rat) (EPBC Act), was not detected during any recent survey efforts. There are numerous areas of potential habitat for the *Zyzomys palatalis* (carpentaria rock-rat) occurring throughout the Investigation Area. These areas consist of higher rocky escarpments and steep foothills with associated incised rocky gullies and drainage lines. These habitat types provide a multitude of small crevices and cracks in the lifted metamorphic rocks. Irrespective of the availability of suitable habitat, this species has an extremely limited distribution known from only four populations near the Northern Territory-Queensland border (>250 km). The *Endangered Zyzomys palatalis* (carpentaria rock-rat) is considered unlikely to exist within the Investigation Area.

Sminthopsis douglasi (Julia Creek dunnart) is listed as *Endangered* under both the EPBC Act and NC Act. Scattered records of this species in areas surrounding the township of Julia Creek are noted; however the nearest record of this species in relation to the Investigation Area occurs approximately 150 km to the north east. Little is known about the habitat requirements of the *Endangered Sminthopsis douglasi* (Julia Creek dunnart), however preferred habitats are characterised by Mitchell grass downs containing cracking clay soils. It is considered unlikely that the *Endangered Sminthopsis douglasi* (Julia Creek Dunnart) exists within the Investigation Area due to the absence of suitable cracking clay soil habitat.

3.3.6 Fauna Groups of the Investigation Area

3.3.6.1 Amphibians

Previous surveys have identified five amphibian species within the locality (**Appendix E**), none of which are listed as species of conservation significance under the EPBC Act or NC Act.

The presence of amphibians is strongly influenced by attributes such as wetlands and streams containing dense fringing vegetation, with leaf litter, fallen logs, rocks and debris, and for some species tree hollows. Although there were no amphibian species recorded during this current survey, there is suitable amphibian habitat present within the Investigation Area. These habitat features are predominantly located within the riparian and lower alluvial habitat types. Owing to the presence of suitable breeding and foraging habitats within these riparian and alluvial areas, it is likely that many of the species recorded by previous surveys could be expected to occur on the Investigation Area, particularly during and after the wet season. Recent surveys were conducted during rain and very cold weather conditions (**Appendix H**), as a result was not ideal for the detection of amphibians.

It is likely that a number of amphibian species inhabit the Investigation Area including *Litoria caerulea* (green tree-frog); *Litoria rubella* (desert tree frog); *Cyclorana australis* (water holding frog); *Opisthodon ornatus* (ornate burrowing frog); and the exotic *Rhinella marina* (cane toad).

3.3.6.2 Reptiles

Previous surveys have identified thirty-nine reptile species within the locality (**Appendix E**); including the *Acanthopis antarcticus* (common death adder) which is listed as *Near Threatened* under the NC Act. Reptile occurrence within the Investigation Area was relatively dispersed, with records obtained from numerous sites throughout the Investigation Area.

Habitat quality for reptiles is strongly influenced by attributes such as leaf litter, fallen logs and debris, tree hollows, suitable prey, dense groundcovers, decorticated bark, rocky outcrops, crevasses and habitats of varying thermal properties (enabling effective thermoregulation). These attributes are most common in undisturbed natural environments. The majority of the Investigation Area provides moderate to high quality habitat for reptile species within the locality. This is owing to the presence of a multitude of habitat types which all include varying densities of *Triodia molesta* (pincushion spinifex), rocky outcrops and riparian areas. Higher quality reptile habitat is associated with the steeper slopes, rocky outcrops and riparian areas with dense understoreys, fallen timber and debris from floods etc.

The most recent surveys detected eight reptile species representing three families, with the majority of the diversity (5) belonging to the Agamidae (Dragons) family. Two species from the family Elapidae (front fanged snakes) were also noted within the survey efforts, including the *Pseudonaja nuchalis* (western brown snake) and *Pseudonaja textilis* (eastern brown snake). *Pseudonaja nuchalis* (western brown snake) has not previously been recorded during other surveys within the locality. **Appendix I** provides a list of the species identified during recent surveys with the Investigation Area.

No *Varanis* spp (monitors) were identified within the most recent surveys, however it is considered highly likely that a number of monitor species inhabit the Investigation Area.

Despite a number of freshwater dams within the Investigation Area (Selwyn 1 ML and Mount Victoria ML) that have the potential to support freshwater turtles. No freshwater turtles were noted by direct or indirect evidence during all surveys.

It is envisaged that a greater diversity of reptile species persist within the Investigation Area than those identified during recent surveys, such as those recorded in previous surveys and database searches (**Appendix E**).

The listed *Acanthopis antarcticus* (common death adder) was not recorded during recent surveys; however the species has been previously documented within the Investigation Area.

3.3.6.3

Birds

Owing to the pre wet season timing of this survey it is likely that the majority of bird species which utilise habitats within the Investigation Area were observed. Despite this, species which undertake seasonal migrations or those that are locally *Near Threatened* or nomadic with wide-spread movements, may occasionally utilize habitats in the Investigation Area and surrounding landscape; however may have not been recorded. Season densities of suitable prey such as rodents generally increase in the late and post wet season. This increase in prey abundance inherently results in the increase of raptor numbers and possibly species

Previous surveys have identified 142 bird species that persist within the locality (**Appendix E**); including four listed under the NC Act and four migratory EPBC Act listed species (**Appendix E**).

The Investigation Area supports a wide diversity of vegetation types which provide habitat for a diverse suite of avifauna species. The recent survey identified seventy-two bird species from twenty-nine families (**Appendix I**).

Two bird species recorded during the current survey are listed as *Near Threatened* under the NC Act (**Table 3**). These species were the *Lophoictinia isura* (square-tailed kite) and *Falco hypoleucos* (grey falcon). Both species were observed on occasions soaring above the higher rocky outcrops and ridges of the Investigation Area.

Migratory birds

Recent surveys identified two species of conservation significance listed under the EPBC Act (**Appendix C**). These species included the *Merops ornatus* (rainbow bee-eater) and *Egretta alba* (great egret). Two additional species, *Apus pacificus* (fork-tailed swift) (AMX 2009) and *Ardea ibis* (cattle egret) (AARC 2002), have previously been recorded within the Investigation Area however were not noted during recent survey efforts. *Merops ornatus* (rainbow bee-eater) was noted regularly hawking from mature vegetation throughout the Investigation Area. Calls were regularly noted within the riparian and dam areas where nesting habitat is more common. *Egretta alba* (great egret) was noted foraging and roosting within the main freshwater dam area located within central portions of the Selwyn 1 ML.

A further six migratory birds species (EPBC Act) have been identified as potentially occurring within the Investigation Area from previous surveys and database searches (**Table 3**). Five of these species include the *Glareola maldivarum* (oriental pranticole), *Haliaeetus leucogaster* (white-bellied sea-eagle), *Charadrius veredus* (oriental plover), *Rostratula benghalensis* (painted snipe), *Rostratula australis* (Australian painted snipe). *Rostratula australis* (Australian painted snipe) is listed as *Vulnerable* under the EPBC Act and NC Act. The migratory nature of these species, coupled with their strong association with wetland areas (usually temporary) fringed by a mosaic of patchy vegetation, means that any the Investigation Area is unlikely to comprise any critical habitat for these species'.

The *Endangered* nomadic *Pezoporus occidentalis* (night parrot) (EPBC Act) has been identified by database searches as potentially occurring in the area as an arid specialist species. This species prefers dense lowland vegetation, primarily consisting of *Triodia* spp. (spinifex). The closest known record of the *Pezoporus occidentalis* (night parrot) is approximately 200 km south-east of the Investigation Area. Given previous impacts from cattle grazing and trampling suitable habitat coupled with the scarcity of confirmed records, it is considered unlikely that this species exist within the Investigation Area, however given its highly cryptic, nomadic nature, its presence cannot be definitively ruled out.

Passerine Birds

Riparian forested habitats and undulating plains containing moderate canopy and dense mid-strata vegetation comprised a significantly large suite of avifauna within the Investigation Area. The Investigation Area provides a good cross section of habitat types for smaller passerine species. Passerine species were noted in all habitat types across the Investigation Area, however were most abundant in habitat types associated with riparian, dam and steeper foothills containing larger and denser Spinifex groundcover.

Riparian and forested areas provide high quality habitat for a variety of typically smaller, forest birds from the families Dicuridae, Estrildidae, Meliphagidae, Meropidae, Pachycephalidae, Petroicidae and Psittacidae. Areas aligned with the Mort River and riparian channels contain mature *Eucalyptus camaldulensis* (river red gum) canopy that provide potential nesting tree hollows for forest birds from the families Cacatuidae and Psittacidae.

Habitats containing copses of Spinifex and varying densities of mid-strata vegetation were primarily dominated by a mixture of larger nomadic and smaller grass species. Species that were regularly documented include *Amytornis purnelli ballarae* (kalkadoon grasswren), *Artamus minor* (little woodswallow), *Artamus cyanopterus* (dusky woodswallow), *Cracticus tibicen* (Australian magpie), *Cracticus nigrogularis* (pied butcherbird), *Cracticus torquatus* (grey butcherbird), *Cacatua sanguinea* (little corella), *Eolophus roseicapilla* (galah), *Coracina novaehollandiae* (black-faced cuckoo-shrike), *Geopelia cuneata* (diamond dove), *Geopelia striata* (peaceful dove), *Geophaps plumifera* (spinifex pigeon), *Ocyphaps lophotes* (crested pigeon), *Phaps chalcoptera* (common

bronzewing pigeon), *Corvus coronoides* (Australian raven), *Corvus orru* (Torresian crow), *Taeniopygia guttata* (zebra finch), *Malurus lamberti* (variegated fairy-wren), *Coturnix ypsilphora* (brown quail) and *Eremiornis carteri* (spinifexbird). These species also frequently formed components of riparian and forested habitats.

Diurnal Raptors

Diurnal raptors were well represented throughout the survey. Species of diurnal raptors that were frequently recorded during this survey and in surrounding areas include species of the families Accipitridae (*Aquila audax* (wedge-tailed eagle); *Circus assimilis* (spotted harrier); and *Milvus migrans* (black kite) *Lophoictinia isura* (square-tailed kite)) and Falconidae (*Falco berigora* brown falcon, *Falco peregrinus* (peregrine falcon), *Falco longipennis* (Australian hobby) and *Falco hypoleucos* (grey falcon)). Habitat for diurnal raptor species is common throughout the locality with large trees lining dam areas, riparian channels and incised drainage lines, high rocky outcrops and an abundance of smaller mammalian prey species.

Diurnal raptor species often have extensive home ranges encompassing a matrix of foraging, roosting and breeding habitats. The Investigation Area provides a good cross section of habitat types which are common throughout the greater locality. It is expected that a greater number of additional diurnal raptor species occur within the locality include *Hamirostra melanosternon* (black-breasted buzzard) *Elanus scriptus* (letter-winged kite), *Elanus axillaris* (black shouldered kite), *Circus approximans* (swamp harrier), *Circus assimilis* (spotted harrier), *Hieraaetus morphnoides* (little eagle), *Accipiter fasciatus* (brown goshawk), *Accipiter novaehollandiae* (grey goshawk), *Accipiter cirrocephalus* (collared sparrowhawk), *Falco cenchroides* (nankeen kestrel), and *Haliastur sphenurus* (whistling kite). The white-bellied sea eagle is an occasional migrant along the larger river systems in the region including the Mort River.

Nocturnal Birds

Three nocturnal bird species were recorded during recent surveys. The most commonly recorded species was *Eurostopodus argus* (spotted nightjar). This species was encountered on numerous occasions during each night and noted as very abundant throughout the Investigation Area. Owing to the Investigation Areas diverse habitats, this species is likely to occur abundantly throughout the extent of the Investigation Area and throughout surrounding lands. *Nycticorax caledonicus* (nankeen night-heron) was recorded on a single occasion foraging around the banks of a dam in Selwyn 1 ML. The presence of permanent freshwater in this area is likely to result in regular use by this species.

The current surveys also recorded *Aegotheles cristatus* (Australian owlet-nightjar) in a number of locations throughout the Investigation Area. Although this species is nocturnal, it was only recorded during diurnal survey efforts in roosting habitats. Past surveys throughout the locality have recorded a larger number (4) of nocturnal birds, including *Ninox connivens* (Barking Owl), *Ninox novaeseelandiae* (southern boobook), *Tyto alba* (barn owl) and *Podargus strigoides* (tawny frogmouth). Due the diversity of habitats on Investigation Area and the typical large ranges of nocturnal raptors, it is likely that these other undetected species exist in the locality.

3.3.6.4

Mammals

Previous surveys have identified forty-one mammal species to persist within the locality (**Appendix E**), including three species of conservation significance. These species include the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act) and *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby) (NC Act) **Appendix C** and **Appendix D**.

The presence of a diverse range of mammalian species is primarily determined by a matrix of complex features including large contiguous patches of woodland, grassland,

shrubland of varying age cohorts, rocky outcrops and escarpments, old growth trees with hollows, water bodies and waterway corridors.

Small/medium terrestrial mammals tend to occur in highest densities in association with continuous habitat and a complex high quality vegetation structure. They particularly favour patches of vegetation with a dense understorey layer, such as mature *Spinifex* clumps or fallen debris common across the Investigation Area. These areas provide nesting opportunities, refuge from predators, and foraging resources. Small terrestrial mammal species within the include herbivorous and carnivorous species such as the *Zyomys argurus* (common rock-rat); *Sminthopsis crassicaudata* (fat-tailed dunnart); *Notomys alexis* (spinifex hopping mouse); *Mus musculus* (house mouse) and *Rattus rattus* (black rat). A number of exotic medium sized terrestrial mammals inhabit the locality including the *Felis catus* (feral cat); *Sus scrofa* (feral pig); and *Canis familiaris* (feral dog)

Large herbivorous terrestrial mammals such as macropod species generally prefer wide-ranging foraging habitat often close to riparian areas providing water and rocky escarpments providing shelter habitat in caves. Large exotic mammals also utilise these broad open habitats for foraging purposes, these species include *Camelus dromedaries* (wild camel); and *Bos taurus* (cow) however it should be noted that the Investigation Area supports a number of cattle stations.

Recent surveys identified eighteen mammalian species, including three of the previous detected native mammal species, *Macropus rufus* (red kangaroo), *Macropus robustus* (common wallaroo) and *Macropus giganteus* (eastern grey kangaroo), (**Appendix E**). A further two native mammalian species were detected using expert scat analysis (Barbara Triggs) (**Appendix J**). These species included the *Tachyglossus aculeatus* (short-beaked echidna) and *Onychogalea unguifera* (northern nailtail wallaby). *Onychogalea unguifera* (northern nailtail wallaby) has not previously been recorded in the locality by previous surveys. All species are likely to utilise numerous occasions in open undulating plains, densely vegetated riparian waterways, and steeper rocky escarpments.

Zyomys argurus (common rock-rat) was also detected during recent surveys. This species was captured using Elliot trapping and infra-red cameras on the higher rocky escarpments and associated higher slope rocky drainage lines of Mount Dore 1 ML (Decline Area). Also typical of these areas were sections of dense mature *Triodia molesta* (pincushion spinifex) and occasion clumps of *Acacia chisholmii* (Chisholm's wattle). Areas associated with the higher slopes and rocky ridges, riparian channels and incised drainage lines provide the highest quality habitat for this species as well as a much broad suite of smaller mammalian species.

Previous surveys have recorded the listed *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby) (NC Act) in environments within and surrounding the Investigation Area. The *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby) was identified in three locations throughout the Investigation Area. Two sites within the Selwyn 1 ML were identified as disturbed rock dumps created by previous mining overburden. The *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby) was also confirmed in natural habitat areas (Selwyn 3 ML) following scat analysis by expert Barbara Triggs (**Appendix J**). This species is likely to occur throughout the Investigation Area.

Microchiropteran Bats

The current survey detected six species of microchiropteran Bats using ANABAT echolocation call analysis and photographic evidence (refer **Appendix K** for expert call identification report). While a number of past surveys did not use ANABAT echolocation detection methods, up to seventeen species of microchiropteran Bats have been identified within the Investigation Area and surrounding environments (**Appendix E**).

The current surveys recorded six of these species in the Investigation Area. These included *Chaerophon jobensis* (northern free-tail Bat), *Vespadelus finlaysoni* (Finlayson's

Cave Bat), *Saccolaimus flaviventris* (yellow-bellied sheath-tail bat), *Taphozous georgianus* (common sheath-tail bat), *Nyctophilus sp.* (unidentified long-eared Bat), *Chalinolobus gouldii* (Gould's wattled bat), and the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act). Because of doubt over a number of call sequences identified to species level, all species calls were vouchered and sent for expert verification. Expert analysis concluded that there is a probable likelihood of *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act) existing within the Investigation Area (**Appendix I**). It is considered highly likely that this species exists within the Investigation Area due to the abundance of shallow caves and abandoned mine shafts and structures present which provide preferred roosting habitat.

3.3.7 Exotic and Declared Pests

During the recent survey of the Investigation Area, five exotic species were identified via observation and expert scat analysis (Barbara Triggs – **Appendix J**). These species include *Bos taurus* (cow), *Rattus rattus* (black rat), *Mus musculus* (house mouse), *Felis catus* (feral cat), and *Oryctolagus cuniculus* (rabbit). Previous surveys identify another four exotic species not detected by recent surveys, including *Equus caballus* (horse), *Sus scrofa* (feral pig), *Canis familiaris* (dingo), *Vulpes vulpes* (fox), *Rhinella marina* (cane toad), and *Camelus dromedarius* (camel).

Four exotic species known to exist in the locality are Class 2 declared under the schedules of the *Land Protection (Pest and Stock Route) Management Act 2002*. These species include *Felis catus* (feral cat), *Canis familiaris dingo* (dingo) and *Oryctolagus cuniculus* (rabbit).

Non-declared exotic species include *Bos taurus* (cattle), *Equus ferus caballus* (horse), *Rhinella marina* (cane toad), *Rattus rattus* (black rat), and *Mus musculus* (house mouse).

3.4 Summary of Immediate Impact Areas

3.4.1 Access Road

3.4.1.1 Present Status

The proposed Access Road alignment is 15 km long and extends from the Lucky Luke Mining Lease to the centre of the Investigation Area. The centre line of the proposed Access Road was identified with a small vehicular track created for access and assessment purposes. A corridor width of approximately 100 m (50 m either side of the proposed centre line of the Access Road) was subject to this assessment. **Figure 3** demonstrates the Access Road alignment in relation to the Lucky Luke ML and Selwyn 1 ML. It also demonstrates the number and segment of the Access Road alignment that have been demonstrated in greater detail within **Figure 4** and **Figure 5**.

The area estimated to be disturbed as a result of the construction of the Access Road was surveyed by means of vehicular and foot traverses, resulting in a species list for, and assessment of, the structural composition of each identified Regional Ecosystem and major vegetation community recognised by the Queensland Herbarium (2009) crossing the alignment. Regional Ecosystems were mapped based on existing geology mapping, observed floristic composition and condition. Suitable habitats were searched for potentially occurring threatened species.

3.4.1.2 Vegetation and Regional Ecosystems

Plants

Flora Species of Conservation Significance

A combined total of 84 vascular plant species were recorded, comprising a high proportion of the 92 species recorded across the entire Investigation Area, indicative of the significant impact of the proposed linear development. None of the flora species recorded during the field survey are listed under the NC Act or the EPBC Act. It is unlikely that these species will occur with the Access Roads proposed alignment.

Weeds

Of the total 84 recorded flora species, 2 species, or 2.4%, are exotic species naturalised in Queensland. Neither of these species is declared under the schedules of the LP Act

Vegetation

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation association over most of the area. On the rocky upper slopes of the eastern fringe *Acacia cambagei* (gidgee) becomes the dominant species. A shrub layer of topography-dependent density is dominated by species of the genera *Acacia* and *Senna*. This strata varies from extremely sparse in the south-west plains, to sparse in the foothills and medium within the drainage lines. The seasonally depauperate ground layer is dominated by *Triodia molesta* (pincushion spinifex); apart from the western gibber plains which are dominated by indigenous species of *Poaceae*.

Most drainage lines are dominated by a narrow *Eucalyptus camaldulensis* (river red gum) woodland which has a typically sparse shrub layer dominated by *Acacia chisholmii* (Chisholm's wattle) and a ground layer dominated by the exotic species **Pennisetum ciliare* (buffel grass).

Three regional ecosystems RE1.3.7, RE1.5.3 and RE1.11.2 represented spatially along the alignment (**Figure 4a-b**) are present along the Access Road alignment. RE1.11.2 is represented by a major vegetation community described by Queensland Herbarium (2009); RE1.11.2e. All REs carry a vegetation management status of *Least Concern*. With the exception of RE1.3.7 which carries a biodiversity status of *Endangered*, RE1.5.3 and RE1.11.2 have a biodiversity status of *No Concern at Present*.

A large area of highly disturbed land is present at the northern part of the alignment, in the vicinity of the open pit on Selwyn 1.

None of these are considered threatened ecological communities at a national level under the EPBC Act.

RE 1.3.7 – *Eucalyptus camaldulensis* (river red gum) low woodland

Description

This community occurs within a drainage line that bisects the proposed Access Road (**Figure 4**). This community typically occurs on recent levees and channel deposits of larger tributaries, primarily on alluvial soils.

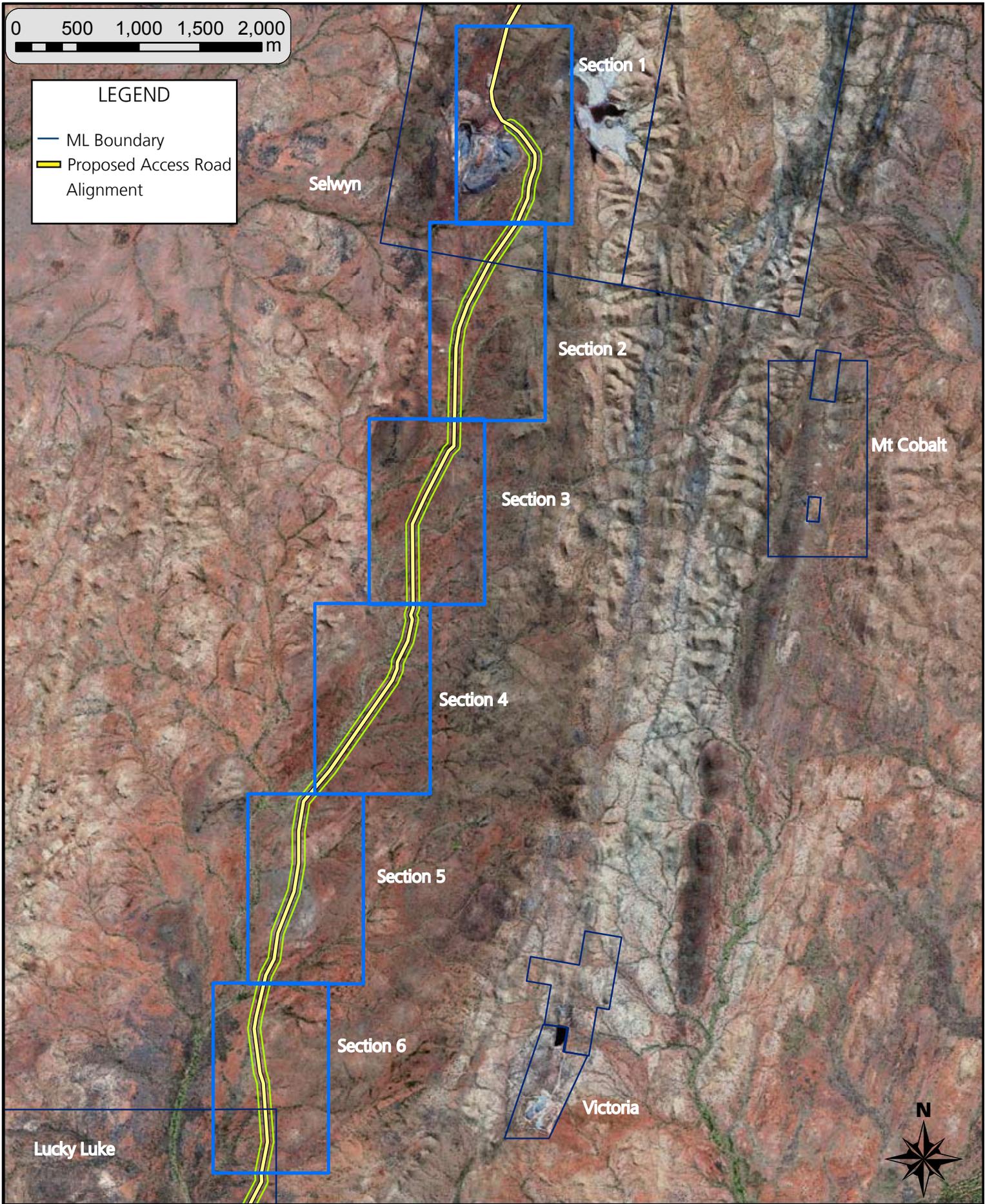
Flora Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this Regional Ecosystem.



LEGEND

- ML Boundary
- Proposed Access Road Alignment



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FIGURE 3:
ACCESS ROAD KEY FIGURE
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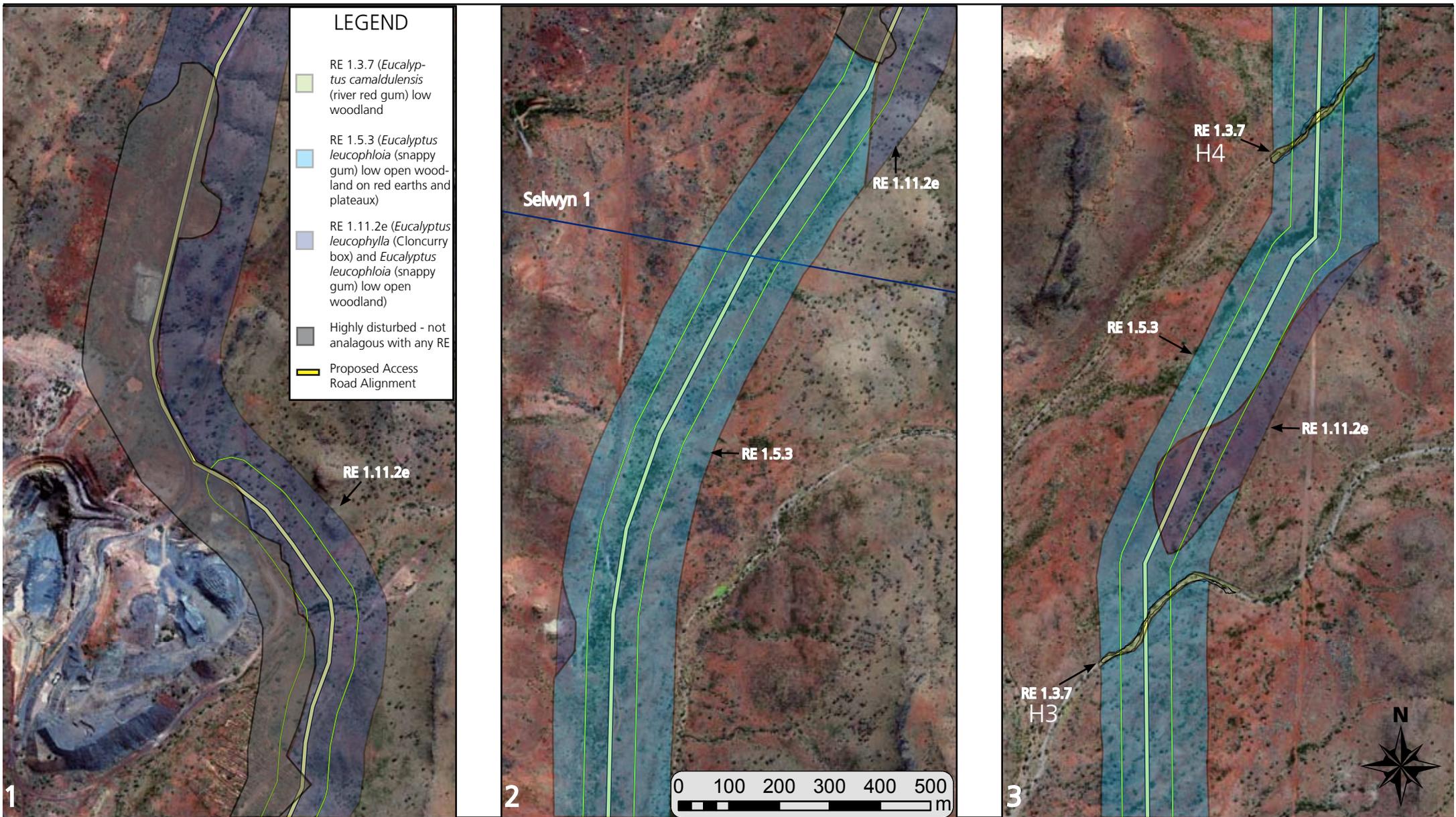
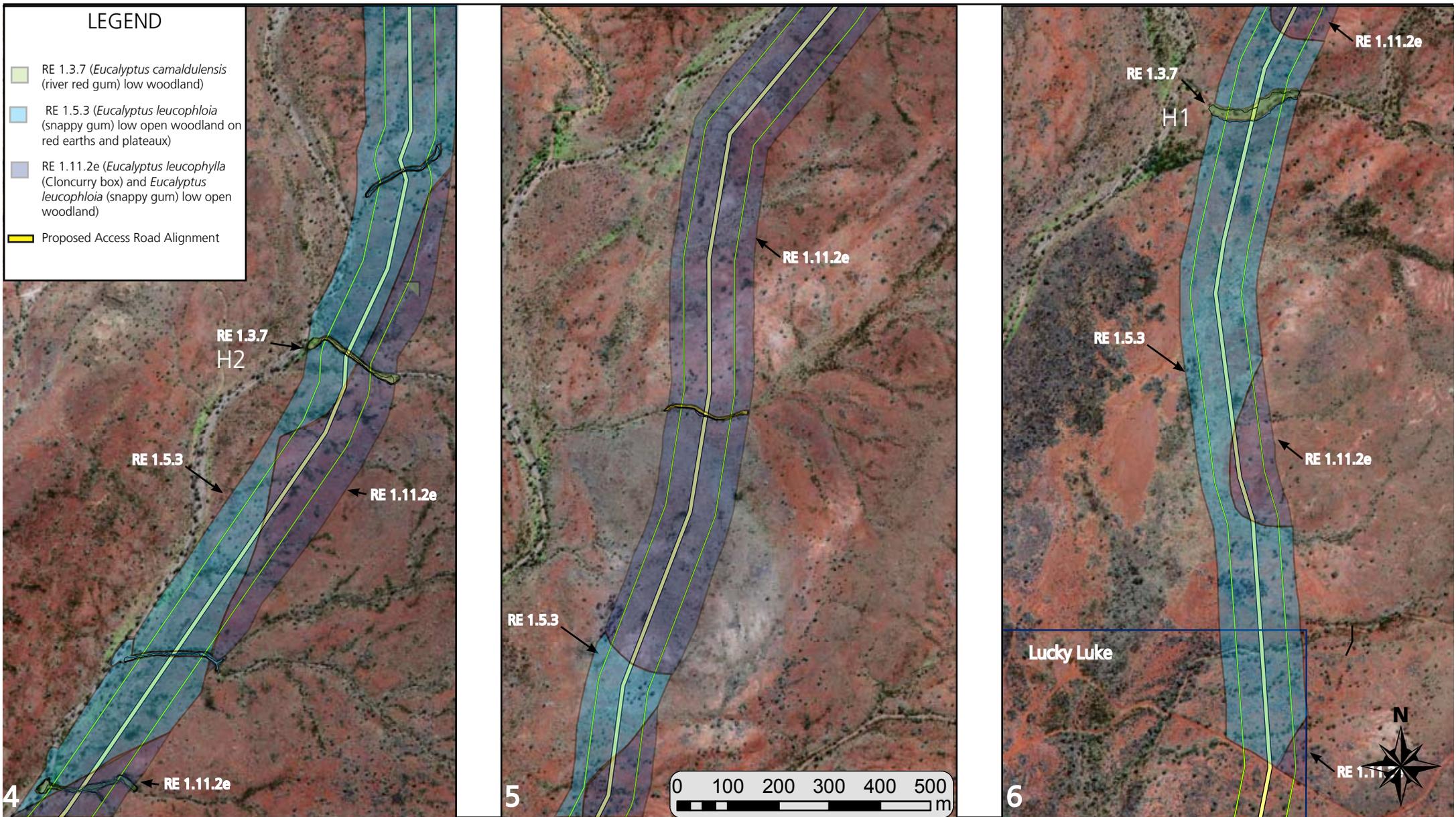


FIGURE 4A: REGIONAL ECOSYSTEMS OF THE ACCESS ROAD ALIGNMENT (SECTIONS 1-3)
 BASELINE ECOLOGICAL REPORT



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**FIGURE 4B: REGIONAL ECOSYSTEMS OF THE ACCESS ROAD
ALIGNMENT (SECTIONS 4-6)
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Weeds

No declared weed species were detected.

Notes

RE1.3.7 is considered *Endangered* under DERM's biodiversity assessment on account of regional degradation by high total grazing pressure (direct impacts associated with trampling, secondary impacts associated with exotic pasture species introductions, principally **Pennisetum ciliare* (buffel grass), and tertiary impacts associated with altered fire regimes (arising from buffel grass which carries a greater biomass than undisturbed systems) and habitat alteration).

RE1.5.3 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on red earths on plateaus.

Description

This community occurs on approximately 50% of the Access Road. Where the Access Road Area traverses the Selwyn MLs a large portion has been disturbed by mining activities. This area presents a mosaic pattern of small patches of surviving vegetation amidst the various disturbances associated with past and present mining activities.

Flora Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this Regional Ecosystem.

Weeds

No declared weed species were detected in this RE.

Notes

RE1.5.3 occurs on undulating plateau surfaces; lateritic red earths, and small areas of shallow sandy loams and skeletal soils.

A number of drainage lines are present within this RE type. Whilst floristic diversity is much simplified when compared to that of the surrounding (broader RE) no major communities are recognised by the Queensland herbarium (2009) for this RE type.

RE 1.11.2e – *Eucalyptus leucophloia* (snappy gum) low woodland to low open woodland on metamorphic geology.

Description

This community occurs on almost half of the Access Road (**Figure 4**). Where the Access Road traverses the Selwyn ML a large portion has been disturbed by mining activities. This area presents a mosaic pattern of small patches of surviving vegetation amidst the various disturbances associated with past and present mining activities.

Flora Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this Regional Ecosystem.

Weeds

With reference to Queensland's LP Act, no declared weed species occur in this community.

Notes

The vegetation present along the Access Road is most similar to recognised major vegetation community RE1.11.2e which is described as (Queensland Herbarium., 2009) a Low open-woodland of *Eucalyptus leucophylla* (snappy gum) and *Eucalyptus leucophloia* (Cloncurry box) often with *Acacia cambagei* (gidgee) and *Corymbia terminalis* (western bloodwood) with a sparse ground layer of *Triodia* spp (Spinifex). RE1.11.2e occurs on footslopes and lower slopes, broken by creeks and drainages.

A number of drainage lines are present within this community type. Whilst these have been mapped as 1.11.2e, floristic diversity is much simplified than that of the surrounding landscape and whilst there may be merit in describing these as the separate community 1.11.2, they are too small to map as such.

3.4.1.3

Fauna

Surveys Conducted

The Access Road alignment was traversed by two ecologists utilising both vehicle and on ground inspections to define all the habitat types present within the alignment. Specific habitat types were noted and the occurrence of habitat types has been located via DGPS. These habitat types generally align with RE's present within the alignment however define wider areas of consistent habitat attributes such as vegetation density and alluvial drainage lines with differing soil types.

Habitat

The Access Road alignment predominately traverses large tracts of slightly undulating hills and flat plains. These areas are dominated by moderately dense ground covers of small to medium *Triodia molesta* (pincushion spinifex) clumps on rocky surfaces. Occasional areas are present which are heavily dominated by stands of *Acacia chilsomii* (Chisholm's Wattle). Canopy vegetation is typically sparse comprising *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). The lower flat plains provide little habitat structure, with numerous cleared patches of red soil and little canopy cover. These areas are primarily dominated by *Aristida contorta* (bunched kerosene grass) and occasional *Triodia molesta* (pincushion spinifex) clumps on very stony soils. These habitat types are unlikely to provide any critical habitat for fauna in the locality apart from movement and forage habitat for nomadic terrestrial mammals and avifauna.

Four main habitat types have been identified within the Access Roads alignment. These habitat types are described as: Undulating plains, Flat Plains, Riparian channels and Lower alluvial drainage lines. **Table 9** defines the habitat types present within the Access Roads alignment their associated RE's and assigned habitat quality rating.

TABLE 9: HABITAT TYPES OF THE ACCESS ROAD ALIGNMENT

Habitat Type	Habitat Reference	Composite RE's	Description	Habitat Quality
Undulating plains	6	1.5.3/1.11.2	Dominated by slightly undulating hills containing moderately dense ground covers of small to medium <i>Triodia molesta</i> (pincushion spinifex) clumps with occasional areas dominated by stands of <i>Acacia chilsomii</i> (Chisholm's Wattle). Canopy is predominately sparse comprising <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood), however can be void of vegetation in areas. Generally stony fine soils.	moderate
Flat plains	7	1.11.2	The lower stony flats and plains provide little habitat structure, with numerous cleared patches of red soil and very little canopy cover. These areas are primarily dominated by <i>Aristida contorta</i> (bunched kerosene grass) and occasional <i>Triodia molesta</i> (pincushion spinifex) clumps on very stony soils.	Low-moderate
Riparian channels	8	1.3.7	These habitats are generally dominated by sporadic mature <i>Eucalyptus camaldulensis</i> (river red gum) reaching a height of 15 - 10 m. The shrub layer consists of sparse <i>Acacia chilsomii</i> (Chisholm's Wattle) and <i>Acacia cambagei</i> (gidgee) with a dense groundcover of <i>Triodia molesta</i> (pincushion spinifex) and fallen branches. Soil is generally coarse alluvium and clay.	high
Lower alluvial drainage lines	9	1.5.3	Dominated by medium to large <i>Triodia molesta</i> (pincushion spinifex) clumps and occasional areas containing stands of dense <i>Acacia chilsomii</i> (Chisholm's Wattle) and <i>Acacia cambagei</i> (gidgee). Contains sparse canopy species in areas comprising of <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood). Soils vary from areas of fine sands to areas covered with small stones and pebbles.	Moderate - high

Highest quality fauna habitat throughout the Access Road alignment exists in the riparian channels and lower drainage lines. These areas typically contain sporadic mature *Eucalyptus camaldulensis* (river red gum) reaching a height of 10 - 15 m, with a sparse understorey of *Acacia chilsomii* (Chisholm's Wattle) and *Acacia cambagei* (gidgee). Groundcover of *Triodia molesta* (pincushion spinifex) is usually dense, and generally contains numerous fallen branches. These areas provide shelter and forage habitat for a range of fauna species, as well as provide corridor connectivity throughout the landscape. The habitats present within the Access Roads alignment are illustrated within **Figure 5**.

Minimal roosting habitat and nesting habitat for larger avifauna occurs along the majority of the Access Road corridor. This is primarily due to the lack of mature eucalypt species along the alignment. The highest quality nesting habitat and roosting habitat for larger avifauna occurs on the broken drainage lines or escarpments in the surrounding landscape. Smaller passerine species potentially nest in denser ground covers and creek banks throughout the Access Road corridor.

Fauna Species of Conservation Significance

The presence of drainage lines and rocky surfaces containing *Triodia molesta* (pincushion spinifex) clumps provides potential habitat for the *Near Threatened Acanthopis antarcticus* (common death adder) (NC Act). There is the potential that migratory wetland species *Ardea ibis* (cattle egret) and *Egretta alba* (great egret) could use riparian channels for movement and temporary forage habitat during and after wet season.



Legend

- Lower Alluvial Drainage Lines
- Riparian Channels
- Flat Plains
- Undulating Plains
- Location of Habitat Surveys



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**FIGURE 5A: HABITAT TYPES OF THE ACCESS ROAD ALIGNMENT
 (SECTIONS 1-3)**

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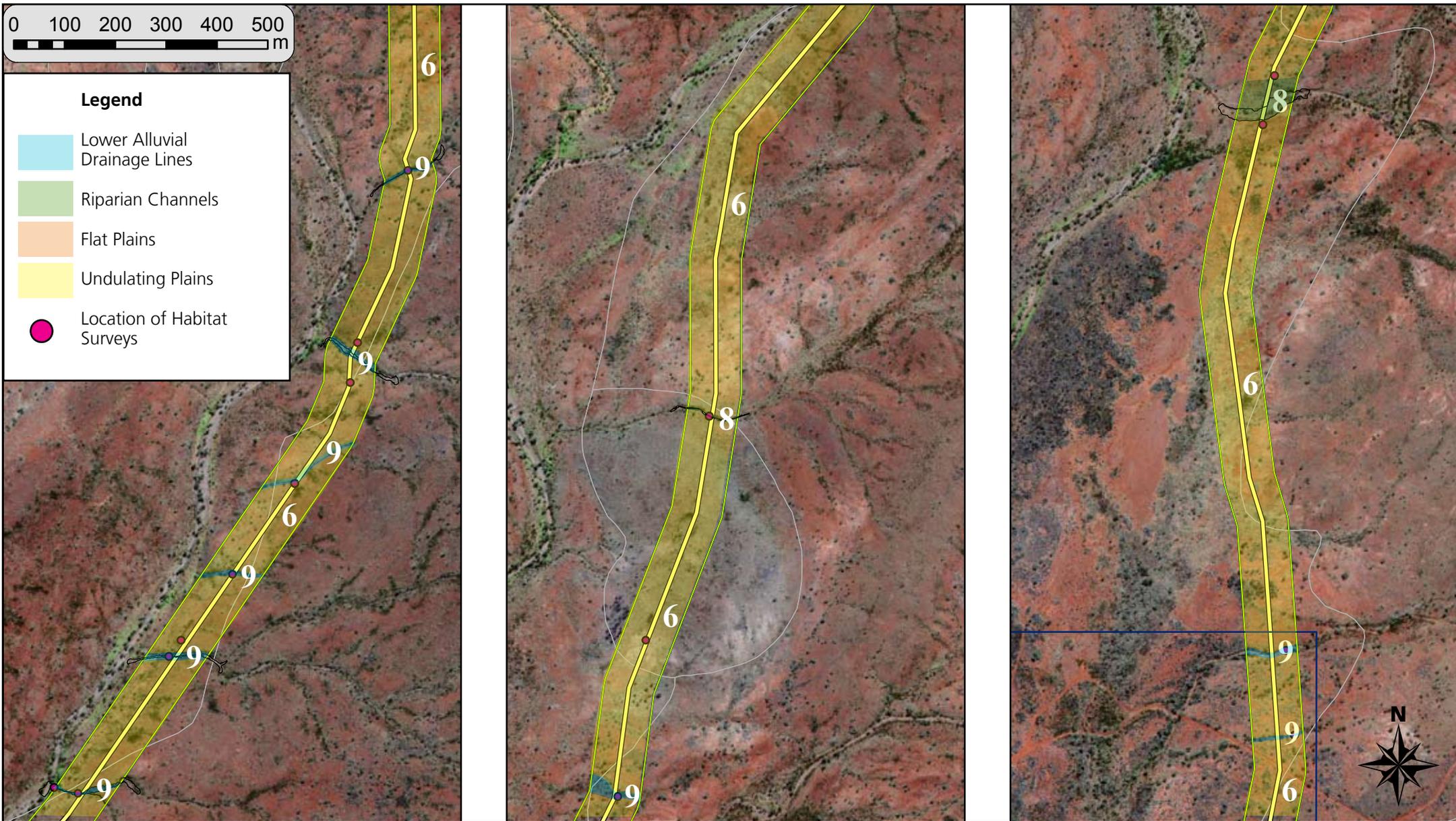


FIGURE 5B: HABITAT TYPES OF THE ACCESS ROAD ALIGNMENT (SECTIONS 4-6)



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Scattered canopy trees and groundcovers of *Triodia molesta* (pincushion spinifex) and other grasses which dominate the ML are likely to be utilised as movement or forage habitat by the *Near Threatened Heteromunia pectoralis* (pectorella manikin).

Higher rocky ridges, riparian channels, open plain areas and nearby rocky ridges are likely to provide forage habitat for the *Near Threatened Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite) (NC Act).

It is likely that the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act) utilises areas that the Access Road alignment traverses as a component of its' large foraging range.

Pests

It is likely that a range of exotic species utilise habitat associated with the Access Road alignment. Open plain areas containing relatively sparse groundcovers, and consistent with local cattle stations, would be frequented by large grazing species including *Equus ferus caballus* (horse), *Bos taurus* (cow), *Sus scrofa* (feral pig), and *Camelus dromedarius* (camel). It must be noted that due to local cattle stations over the Investigation Area, these species are likely to frequent the Access Road, and appropriate management plans should be implemented to avoid vehicular strike.

Other smaller exotic mammal species are likely to utilise all habitat types associated with the Access Road alignment for movement, foraging and shelter. These species have been recorded during the recent survey and/or past surveys in the locality, and include *Rattus rattus* (black rat), *Mus musculus* (house mouse), *Felis catus* (feral cat), *Canis familiaris* (dingo) *Oryctolagus cuniculus* (rabbit), and *Vulpes vulpes* (fox).

3.4.1.4 Impacts of the Access Road

The proposed alignment of the Access Road traverses a small number of RE's which are common to the region, and very common within the Investigation Area in particular. Overall, the proposed construction of the Access Road along this identified alignment would not impact upon significant RE's however a number of riparian crossings occur. These riparian crossings contain vegetation assemblages which are analogous with RE 1.3.7 which has a Biodiversity Management Status of *Endangered*. The primary concern in constructing crossings is to achieve reliable crossing points with good sight lines. Clearing of vegetation will be kept to a minimum whilst maintaining safety.

Little critical habitat for significant fauna species occurs within the majority of the Access Roads alignment. The removal of extremely common habitats within the locality will not significantly reduce habitat in the locality. The major impact areas of the Access Road can be attributed to the riparian crossings. **Figure 4** illustrates the locality and relative size of these riparian vegetation communities crossed. Impacts on riparian habitats will be isolated however. This will not impact on most fauna groups however populations persisting within these waterways such as amphibians may be severed.

Given there will be a severance of drainage line due to the Access Road, impacts will be extremely isolated however potentially impact on the hydrology and function of the waterways. Notwithstanding, measures should be taken to locate crossing points in locations where they would be likely to cause least direct and indirect impacts and to minimise loss of individual trees in these areas as they would benefit fauna by providing potential for older growth vegetation for fauna nesting and foraging, and corridor connectivity. Owing to the canopy tree density it should be possible to develop the alignment to avoid trees.

The increased amount of fast moving vehicles (in particular haul trucks) heightens the likelihood of fauna strike. This is likely to impact upon large macropods and reptilian

species. As a consequence there is further risk of vehicular strike to raptor and bird species scavenging on such carrion.

3.4.1.5 Conclusions and Recommendations

During the most recent dry season surveys no significant environmental constraints were identified within the Access Road alignment. Post-wet season surveys of undisturbed areas of the Access Road and the surrounding areas will allow a better understanding of seasonal variation in flora and fauna persisting within the area.

The proposed Access Road alignment does not traverse any noted Threatened Ecological Communities noted to occur within the region. It is highly unlikely that the construction of the Access Road will impact on any species listed as Matters of National Environmental Significance defined within the EPBC Act.

Three remnant REs were found within the Access Road's alignment. These REs currently have a management status of *Least Concern*. RE 1.11.2e and 1.5.3 are currently assigned with a biodiversity status of *No Concern at Present*. Riparian vegetation communities within the Access Road alignment have been noted as analogous with RE1.3.7 which has a biodiversity status of *Endangered*. These areas will suffer an immediate loss of the key marker species *Eucalyptus camaldulensis* (river red gum).

Based on current information and dry season surveys it is considered that no flora or fauna species, listed as significant under the NC Act will be adversely affected by the proposed development.

However, whilst no species of conservation significance were recorded from this RE, suitable habitat exists for a number of threatened species known to occur in the area, and while the trees and shrubs are easily detectable year-round, certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs are not readily detectable during the dry season. It is therefore recommended that post-wet season surveys are undertaken to assess the presence or absence of these species in the immediate area.

It is recommended that an Environmental Management Plan for the proposed Access Road alignment be prepared before the commencement of construction works. This will serve as a guiding document to minimise the impact on surrounding vegetation and mitigate the cumulative effects of the ongoing disturbance once the Access Road is in operation.

Construction management should include strategies to protect retained vegetation and minimise the disturbance caused by construction vehicles and topsoil/spoil piles. Where the Access Road crosses drainage lines, consideration should be given to maintaining landscape functionality and facilitating the natural movement of rainwater and dispersal of native flora species reliant on these features. Operational management could include strategies to manage weed encroachment and control dust.

Given the lack of high quality habitat noted along the Access Road there is a low risk of impacting on threatened fauna. It is recommended that the following management processes be contemplated:

- RE1.3.7 has a high biodiversity status and minimisation of road crossing widths and avoidance of unnecessary loss of remnant vegetation should be implemented. All vegetation should be inspected to assess the potential for fauna species to be residing within the mature vegetation.
- Significant drainage line crossings (eg. crossing H1, refer **Figure 5b**), will incorporate a mix of piped causeways and low-level causeways, should filling be required to achieve road sealing. This would allow the fluent movement of flood water, preserving the landscape functionality and maintaining habitat for terrestrial fauna species reliant on riparian areas for movement corridors. This would also allow the continuous movement of vehicles during wet periods.

- Ensure that fauna carcasses are moved from the road to a minimum of 20 metres from the road verge. This will avoid further potential for vehicular strikes involving scavenging raptors, birds, mammals and reptiles. It should be noted that this management process is currently implemented at the nearby Barrick Osborne Mine.

3.4.2 Decline Area (Mount Dore 1 ML)

3.4.2.1 Present Status

The Decline Area is situated within the Mt Dore 1 ML and comprises approximately 10 ha designated for the construction of a Decline Mine, Waste Dump and associated infrastructure. The majority of the disturbance area remains as a slightly modified remnant parcel of vegetation with three small vehicular access tracks traversing the site from west to east. These tracks have recently been created to support drilling exploration pads located on the steeper foothills of the MLs eastern mountain range which forms its boundary.

The area demarcated for disturbance was surveyed on foot, using meander traverses of the entire site to compile a complete floristic inventory assessment of the structural composition of each identified vegetation community. Regional Ecosystems were mapped based on existing geology mapping, observed floristic composition and condition (**Figure 6**). Suitable habitats were also searched for potentially occurring threatened species.

3.4.2.2 Vegetation and Regional Ecosystems

Plants

Flora Species of Conservation Significance

A total of 60 vascular plant species were recorded. None of these are listed under the NC Act or the EPBC Act.

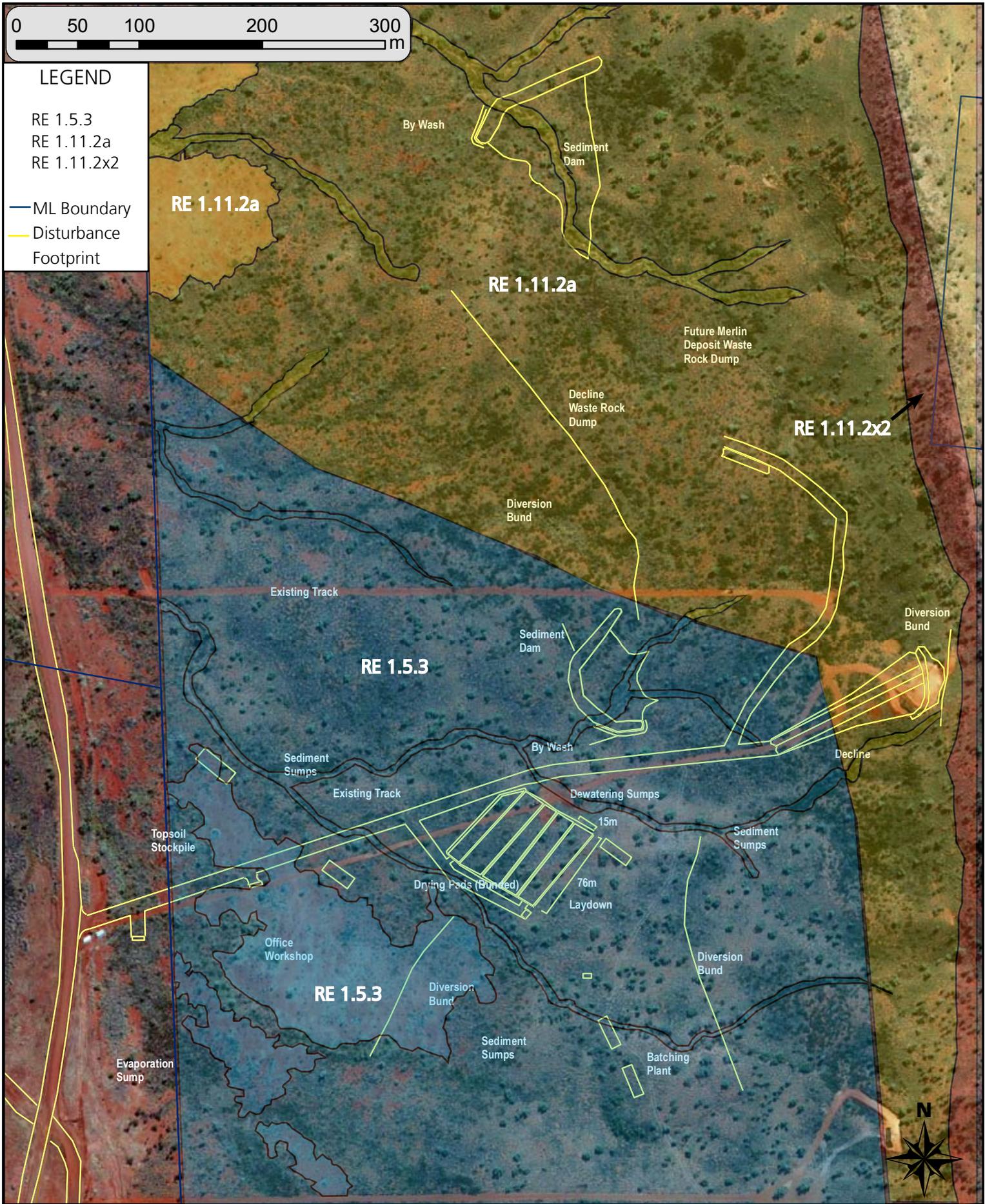
Weeds

No naturalized species, or any species listed under the LP Act, were recorded within the Decline Area.

Vegetation

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation association over most of the area. On the rocky upper slopes of the eastern fringe *Acacia cambagei* (gidgee) becomes the dominant species. A shrub layer of topography-dependent density is dominated by species of the genera *Acacia* and *Senna*. This strata varies from extremely sparse in the south-west plains, to sparse in the foothills and medium within the drainage lines. The seasonally depauperate ground layer is dominated by *Triodia molesta* (pincushion spinifex); apart from the western gibber plains which are dominated by indigenous species of *Poaceae*.

Two analogous regional ecosystems are present on the site; RE 1.5.3 on colluvium, skeletal soils and red earths; and RE 1.11.2, with major vegetation communities described by Queensland Herbarium (2009); RE1.11.2x2 and 1.11.2a being present. The REs are represented spatially as **Figure 6**. Both REs carry a vegetation management status of *Least Concern* and a Biodiversity status of *No Concern at Present* which are the lowest conservation significance levels (greater than 30% of the pre-settlement RE remains). one of these are considered threatened ecological communities at a national level under the EPBC Act.



**FIGURE 6:
VEGETATION COMMUNITIES OF
THE DECLINE AREA**
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Regional Ecosystem 1.5.3 – *Eucalyptus leucophloia* (snappy gum) low open-woodland

Description

This RE encompasses approximately 50% of the southern portion of the survey area. It encompassed lower slopes with lateritic red earths and small areas of shallow sandy loams and skeletal soils on lower slopes. Treeless patches are present.

Flora Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this Regional Ecosystem.

Weeds

No declared weed species were recorded.

Notes

A number of drainage lines are present within this RE type. Whilst floristic diversity is much simplified when compared to that of the surrounding (broader RE) no major communities are recognised by the Queensland herbarium (2009) for this RE type.

Regional Ecosystem 1.11.2 – *Eucalyptus leucophloia* (snappy gum) low woodland to low open-woodland

Description

This RE encompasses approximately 50% of the northern portion of the survey area. It encompassed lower slopes with red earths, steep hills and strike ridges and rocky upper slopes. Treeless patches are present.

Flora Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this Regional Ecosystem.

Weeds

No declared weed species were recorded in these communities.

Notes

Within the decline area two major vegetation communities recognised by the Queensland Herbarium (2009) occur:

1.11.2a: Low open-woodland of *Eucalyptus leucophloia* (snappy gum) often with *Corymbia* spp. (bloodwood), *Terminalia aridicola* (arid peach) and *Eucalyptus leucophylla* (Cloncurry box) with shrub layer of *Acacia* spp. (wattle) and ground layer of *Triodia* spp. (Spinifex grass). This community occurs on steep hills and strike ridges.

Community 1.11.2x2 – *Acacia cambagei* (gidgee) low woodland to low open woodland. This community occurs on the rocky upper slopes of the site.

Within the survey area Incised drainage lines present do not typically have their own functioning riparian community and floristically are comprised of species found in the broader surrounding RE type.

3.4.2.3 Fauna

Habitats

Figure 7 provides a detailed illustration of the habitats present within the Mt Dore 1 ML. **Figure 8** shows trapping site locations, while **Appendix G** survey and trapping methods employed within the decline area. The Mt Dore 1 ML has been subjected to recent mining exploration. As a result there are a number of vehicular access tracks and a mining pad which are devoid of vegetation. Areas of medium sized rock piles created by road constructions were found to provide high quality shelter habitat for smaller terrestrial fauna.

There is one elongated rocky ridge line extending north-south through the ML. This area contains smaller rock piles and crevices; but no cave habitat. These higher ridges provide quality shelter habitat for a range of small terrestrial fauna. Surrounding high rocky ridges are steeper sloping foothills and incised gullies with dense groundcovers and sparse canopy vegetation on very rocky surfaces. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and avifauna.

Numerous smaller incised gullies aligned with drainage lines from the upper slopes are present. These areas have a very rocky surface on fine alluvial sands, and are dominated by dense clumps of *Triodia molesta* (pincushion spinifex) and *Acacia chisholmii* (Chisholm's wattle). These areas provide high quality forage and shelter habitat for cryptic avifauna and small terrestrial mammals, as well as corridor connectivity from higher slopes to flatter plains.

There are two small isolated knolls which occur in the northern and central portions of the ML. These knolls contain rocky outcrops, however these are unlikely to support a high density of smaller terrestrial fauna given the lack of connectivity with higher quality habitat.

The majority of the ML is dominated by slightly undulating hills to lower flats plains. The areas contain sparse ground covers of *Triodia molesta* (pincushion spinifex) or *Aritida contorta* (bunched kerosene grass) and sparse to bare canopy vegetation. These habitat types are unlikely to provide any critical habitat for fauna in the locality apart from movement and forage habitat for nomadic terrestrial mammals and avifauna.

Fauna Species of Conservation Significance

The presence of rocky knolls, steep foothills and drainage lines provides potential habitat for the *Near Threatened Acanthopis antarcticus* (common death adder) (NC Act). This species is likely to utilise the dense *Triodia molesta* (pincushion spinifex) within the majority of the Investigation Area, however better foraging habitat is associated to the rocky knolls, steep foothills and drainage lines.

Scattered canopy trees and groundcovers of *Triodia molesta* (pincushion spinifex) and other grasses which dominate the ML are likely to be utilised as movement or forage habitat by the *Near Threatened Heteromunia pectoralis* (pectorella manikin).

Higher rocky ridges and open plain areas provide forage habitat for the *Near Threatened Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite) (NC Act). Both species were confirmed within the ML during recent surveys.

It was confirmed during ANABAT echolocation survey methods that the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) utilises the ML as a component of its large foraging range.

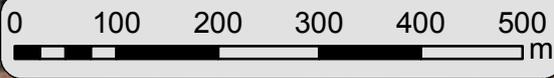


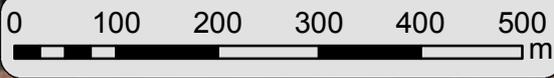
FIGURE 7: HABITAT TYPES OF THE DECLINE AREA



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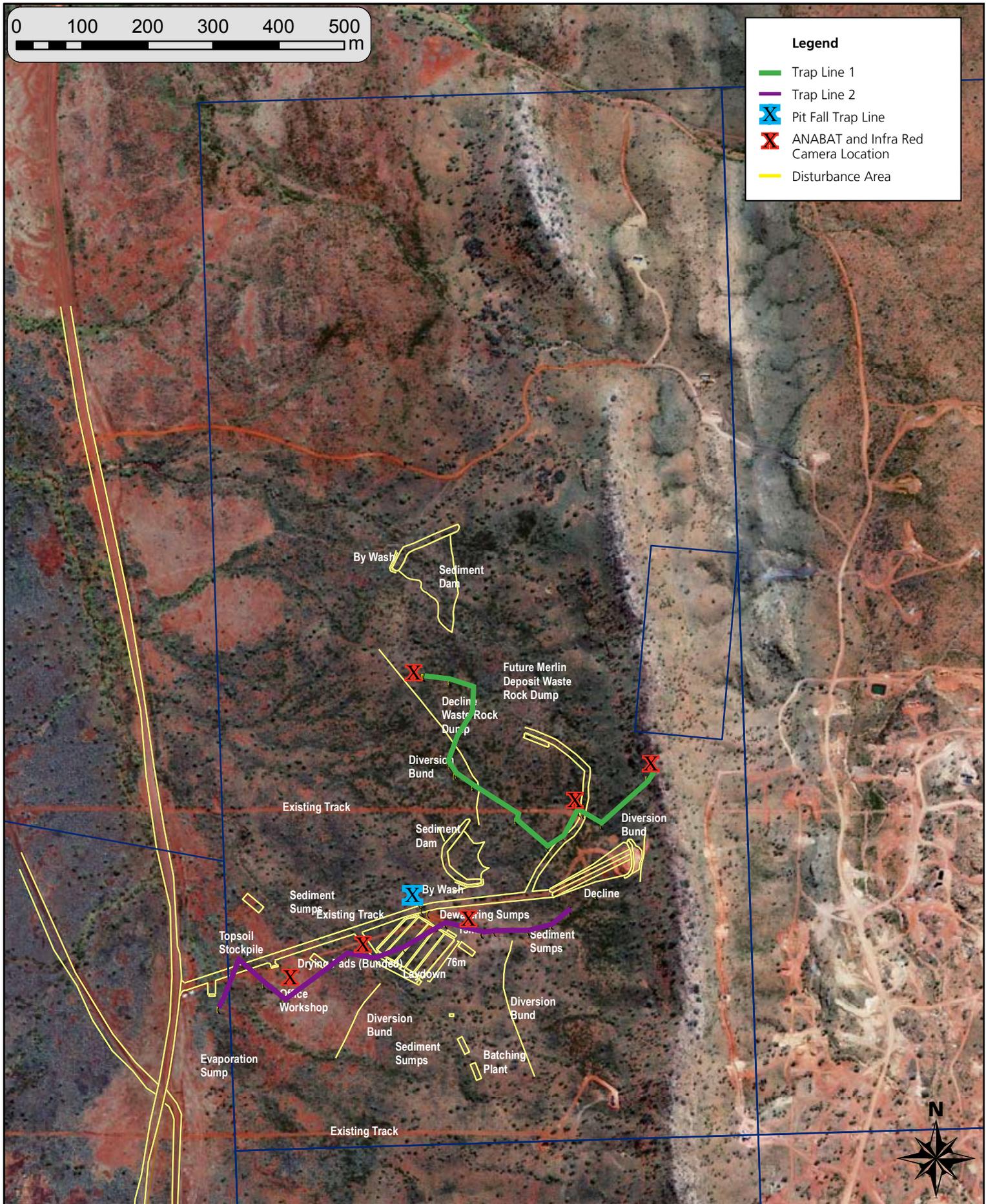
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Legend

- Trap Line 1
- Trap Line 2
- X Pit Fall Trap Line
- X ANABAT and Infra Red Camera Location
- Disturbance Area



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FIGURE 8: FAUNA SURVEY TRAPPING LINES

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Pests

It is highly likely that the full suite of pest species found within the locality would persist within the ML. Smaller terrestrial mammal species not readily visible are likely to occur in higher densities in the disturbed mining operation areas.

3.4.2.4 Effects of the Decline Area

The proposed works associated with the Decline Area will result in the clearing of RE's common to the locality.

Small areas critical habitat for SOCS occurs within Decline Area, however this forms a very small part of much greater habitat range. The selective removal of consise patches of extremely common habitats within the Decline Area will not significantly reduce critical habitat in the locality. Similarly the cumulative impact of habitat removal within the mining lease area will not be significant.

The major impact areas of the Decline Area can be attributed the reduction in the steeper slopes and rocky drainage lines. **Figure 7** illustrates the locality and relative size of these rocky drainage lines and steeper slopes. The nature of the proposed extraction does not require large significant tracts of vegetation to be removed to accommodate these activities.

The increased amount of moving vehicles (in particular haul trucks) heightens the likelihood of fauna strike. This is likely to impact upon large macropods and reptilian species. As a consequence there is further risk of vehicular strike to raptor and bird species scavenging on such carrion.

3.4.2.5 Conclusions and Recommendations

During the most recent dry season surveys no significant environmental constraints were identified within the Decline Area. Post-wet season surveys in surrounding areas will allow a better understanding of seasonal variation in flora and fauna persisting near the Decline Area.

The proposed Decline Area is not located within any noted Threatened Ecological Communities noted to occur within the region. It is highly unlikely that the proposed extractive activities will impact on any species listed as Matters of National Environmental Significance defined within the EPBC Act.

Two remnant REs are found within the Decline Area. These REs currently have VMA classification *Least Concern* and Biodiversity Status *No Concern at Present*. No significant impact on these REs will occur due to the proposed extraction activities due to their dominance in the landscape.

Based on current information and dry season surveys it is considered that no flora or fauna species, listed as significant under the NC Act will be adversely affected by the proposed extractive activities.

It is recommended that an Environmental Management Plan for the proposed Decline Area be prepared before the commencement of construction works. This will serve as a guiding document to minimise the impact on surrounding vegetation and mitigate the cumulative effects of the ongoing disturbance once the Decline Area is in operation.

Construction management should include strategies to protect retained vegetation and minimise the disturbance caused by construction vehicles and topsoil/spoil piles. Where the Access road and waste dump piles cross drainage lines, consideration should be given to maintaining landscape functionality and facilitating the natural movement of rainwater and dispersal of native flora species reliant on these features. Rocky boulders in these drainage lines provide denning and forage habitat for small terrestrial fauna.

Operational management could include strategies to manage weed encroachment and control dust.

In the event of accidental vehicular-fauna strikes, carcasses should be moved from any road to a minimum of 20 metres from the road verge. This will avoid further potential for vehicular strikes involving scavenging raptors, birds, mammals and reptiles.

3.5 Summary of each ML Group

The Investigation Area supports seven ML groups which includes the proposed Access Road from Mt Dore to the northern extent of the Lucky Luke ML. Due to the large and relatively common vegetation and habitat types throughout the Investigation Area, a summation of the Regional Ecosystems, habitat types and potential for threatened species to persist within each ML group has been provided. For extensive detail of Regional Ecosystems and habitat types within each ML please refer to **Appendix A** of this report.

3.5.1 Mount Elliott

3.5.1.1 Present Status

Five (5) MLs comprise the Mt Elliott group. The south-eastern portion of this area (Mt Elliott 1 and 2) has been subject to historical mining activities, with the remainder of the site relatively undisturbed. Although predominantly sparse, the existing vegetation across the majority of the site is in excellent condition, and was assessed as part of this survey to identify all REs and flora species of conservation significance present. **Figure 9** illustrates the RE's present within the Mt Elliot MLs.

Habitat assessments of the Mt Elliot ML's were conducted to investigate specific habitat values attributed to the topography, vegetative conditions and previous disturbance extents. These surveys involved both vehicular and foot traverses by two ecologists to inspect all habitat types across the ML. Aerial photography was also used to aid this assessment to allow an informed interpretation of habitats that are inaccessible by vehicle and foot. No spotlighting was conducted, however investigations of old mining structures and cave areas were conducted via head torch diurnally.

3.5.1.2 Vegetation and Regional Ecosystems

Plants

Flora Species of Conservation Significant

No flora Species of Conservation Significance under either the NC Act or the EPBC Act were recorded within the Mt Elliott group.

Weeds

One introduced flora species, **Pennisetum ciliare* (buffel grass) was recorded within the Mt Elliott group. No species declared under the LP Act were detected.

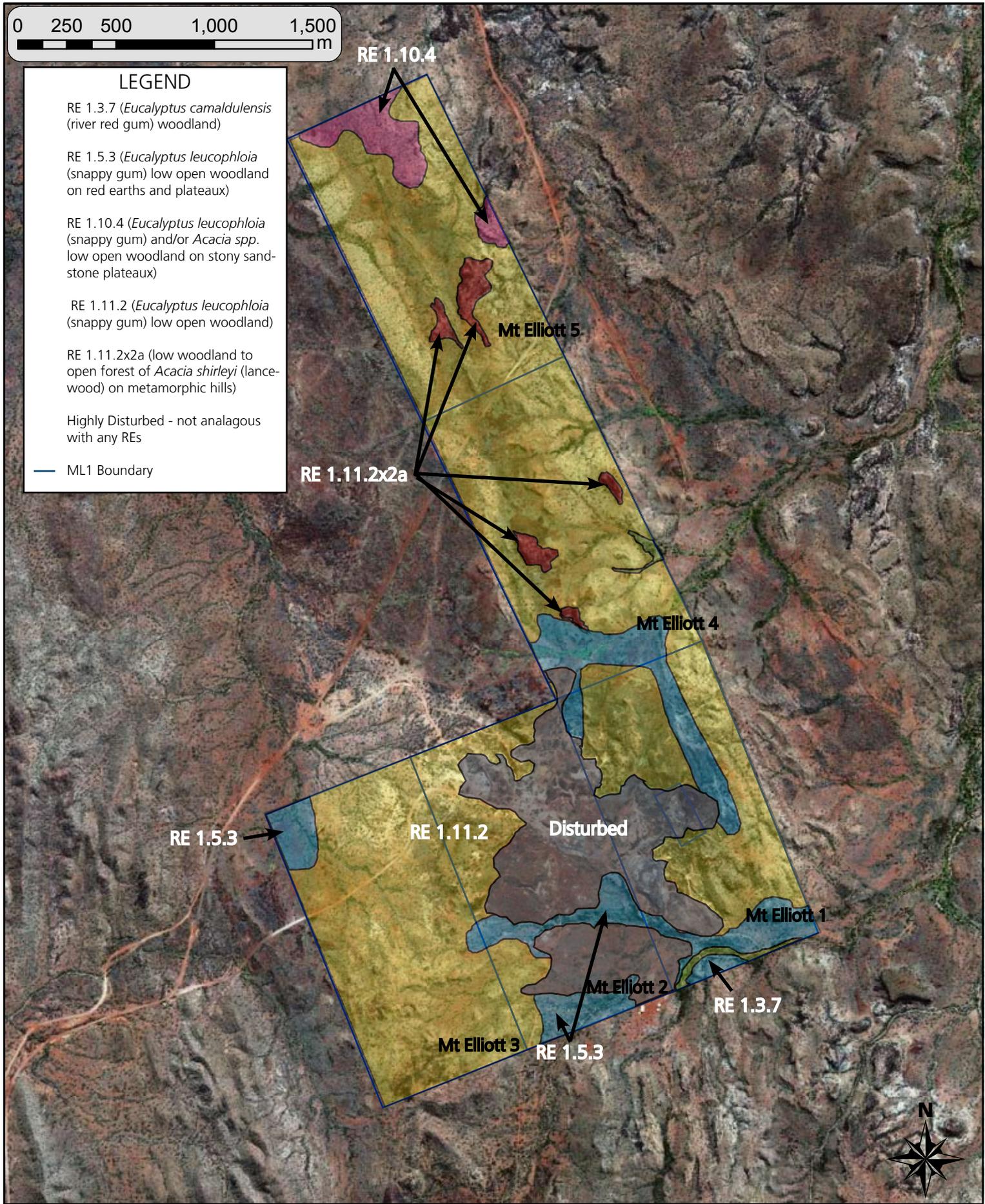
Regional Ecosystems

Four RE's have been indentified within the MT Elliot group which include RE1.3.7, RE1.5.3, RE1.10.4 and RE 1.11.2. Major vegetation community 1.11.2x2a is present within RE1.1.2 on rocky outcrops of Mt Elliott 4 and Mt Elliott 5.



LEGEND

- RE 1.3.7 (*Eucalyptus camaldulensis* (river red gum) woodland)
- RE 1.5.3 (*Eucalyptus leucophloia* (snappy gum) low open woodland on red earths and plateaux)
- RE 1.10.4 (*Eucalyptus leucophloia* (snappy gum) and/or *Acacia spp.* low open woodland on stony sandstone plateaux)
- RE 1.11.2 (*Eucalyptus leucophloia* (snappy gum) low open woodland)
- RE 1.11.2x2a (low woodland to open forest of *Acacia shirleyi* (lancewood) on metamorphic hills)
- Highly Disturbed - not analogous with any REs
- ML1 Boundary



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**FIGURE 9:
 VEGETATION COMMUNITIES OF
 THE MT ELLIOTT MLS
 BASELINE ECOLOGICAL REPORT**

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All of these REs have a management status of *No Concern at Present*. RE 1.3.7 (*Eucalyptus camaldulensis* (river red gum) woodland) has a biodiversity status of *Endangered*. The remaining REs carry a biodiversity status of *No Concern at Present*.

None of the REs have any equivalency with threatened ecological communities listed under the EPBC Act.

3.5.1.3

Fauna

Habitats

The Mount Elliot ML is subject to past and current mining activities. For the most part, access roads and mining operational areas are void of vegetation. Old mining structures (most notably the smelting plant) provide roosting habitat for microchiropteran bat species. A large subsidence area containing dense native regeneration may provide sub-surface soil hollows suitable for terrestrial mammal and reptile species.

The majority of the ML is dominated by undulating hills containing sparse ground cover and canopy vegetation. These areas provide little fauna habitat. Large riparian channels and narrow lower alluvial drainage lines that dissect the ML provide potential corridor connectivity throughout the landscape, as well as high quality forage, nesting and movement habitat for a range of mammal, reptile, amphibian and avifauna.

High quality habitat throughout the ML exists throughout the higher rocky escarpments and rocky knolls. The northern portions of the Mt Elliot ML's supported areas of sandstone ridgelines with a myriad of shallow weathered caves and overhangs. Southern portions of the MLs did not support a significant amount of cave habitat due to the lower undulating ridges and extensive mining activities.

Areas of cracking clays were noted in close proximity to the northern most ML of the Mount Elliot ML group.

Fauna Species of Conservation Significance

The presence of rocky knolls, steep foothills and drainage lines provides potential habitat for the *Near Threatened Acanthopis antarcticus* (common death adder) (NC Act). This species is likely to utilise the dense *Triodia molesta* (pincushion spinifex) within the majority of the Investigation Area, however better foraging habitat is associated to the rocky knolls, steep foothills and drainage lines.

Scattered canopy trees and groundcovers of *Triodia molesta* (pincushion spinifex) and other grasses which dominate the ML are likely to be utilised as movement or forage habitat by the *Near Threatened Heteromunia pectoralis* (pectorella manikin).

Higher rocky escarpments and open plain areas are likely to comprise forage habitat for the *Near Threatened Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite) (NC Act).

Higher rocky escarpments may provide suitable shelter crevices and caves for the *Petrogale purpureicollis* (purple-necked rock-wallaby).

Old mining structures and rocky escarpments may provide suitable roosting habitat for the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act) and *Vulnerable Macroderma gigas* (ghost bat) (NC Act).

A large area to the west of the ML's associated with the old Selwyn cemetery has the potential to provide cracking clay habitat required by the *Endangered Sminthopsis douglasi* (Julia Creek dunnart) (EPBC Act). Trapping in these areas occurred for one night during the most recent surveys however no terrestrial fauna was captured.

Pests

It is highly likely that the full suite of pest species found within the locality would persist within the ML. Smaller terrestrial mammal species not readily visible are likely to occur in higher densities in the disturbed mining operation areas.

3.5.1.4 Conclusions and Recommendations

Due to the timing of the most recent survey efforts, it is recommended that detailed wet season surveys be carried out to ascertain any seasonal variance in both flora and fauna assemblages.

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Mt Elliott MLs. A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance, as well as enable the mapping with the use of Differential GPS of the complete extent of RE 1.3.7 to avoid impact.

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities in the event of any further mining activities.

Further detailed investigations into the identification of the population of microchiropteran bat species utilising the copper/gold mine and smelter within the Mt Elliot ML should be conducted. From photographic and ANABAT echolocation evidence it is highly likely that the population of microchiropteran bat species is the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act).

Taphozous troughtoni (Troughton's sheath-tail bat) is sympatric with *Least Concern Taphozous georgianus* (common sheath-tail bat) and is often found roosting together. This species generally roosts in caves and crevices, however have adapted to disturbance and readily roosts disused mining shafts and workings. Physical capture and identification of these bats will be required to confirm the species and thus conservation significance. If present, sealing of old mining shafts or buildings may potentially result in the loss of a known sub-population or roosting habitat of this species.

Any future works that potentially impact on known populations or potential roosting habitat should be considered *The Action Plan for Australian Bats*, prepared by the Biodiversity Group of Australia and a referral to DERM for review.

The southern portions of the ML have been subject to previous and current disturbance and it is unlikely that any further works will have a significant impact on any threatened species outside of the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act). The northern portions of the Mt Elliot ML that support sandstone geology with weathered caves provide good habitat for the *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby). Impacting on these cave areas potentially displaces individuals and may have an impact on the local population.

Should the *Taphozous troughtoni* (Troughton's sheath-tail bat) be confirmed, the location, species and densities should be submitted to the Department of Sustainability, Environment, Water, Population and Communities to assist with the gathering of data for this species.

Given the Mt Elliot ML distance from any known populations of the *Sminthopsis douglasi* (Julia Creek dunnart), it is unlikely that this species persists within this ML or in surrounding habitats. Further investigation should however be conducted if any proposed activities impact on cracking clay habitats.

It is recommended that any future mining activities outside of the currently disturbed areas consider more detailed surveys to ensure that no further impacts on the noted threatened species occurs.

Any future clearing activities should consider the potential for nesting threatened raptor species. Given the increased vehicular activity (in particular larger trucks), fauna carcasses brought about by accidental vehicular strike should be moved from any road to a minimum of 20 metres from the road verge. This will avoid further potential for vehicular strikes involving scavenging raptors, birds, mammals and reptiles.

3.5.2 Lady Ella

3.5.2.1 Present Status

The Lady Ella ML consists of singular lease, with historical mining disturbance concentrated within the centre of the ML. Although predominantly sparse, the existing vegetation across the remainder of the site is in excellent condition, and was assessed as part of this survey to identify all REs and flora Species of Conservation Significance present. **Figure 10** illustrates the RE's present within the Lady Ella ML.

Habitat assessments of the Mt Ella ML's were conducted to investigate specific habitat values attributed to the topography, vegetative conditions and previous disturbance extent. These surveys involved both vehicular and foot traverses by two ecologists to inspect all habitat types across the ML. Aerial photography was also used to aid this assessment to allow an informed interpretation of habitats that are inaccessible by vehicle and foot. No spotlighting was conducted, however investigations cave and ridge line areas were conducted diurnally.

3.5.2.2 Vegetation and Regional Ecosystems

Plants

Flora Species of Conservation Significance

No flora Species of Conservation Significance listed under either the NC Act or the EPBC Act were recorded within the Lady Ella ML.

Weeds

No declared LP Act weed species were detected within the Lady Ella ML.

Regional Ecosystems

Four RE's have been indentified within the Lady Ella ML which include RE1.3.7, RE1.10.4, and RE 1.11.2. Major vegetation community recognised by the Queensland Herbarium (2009) RE1.11.2x2a is present within RE1.1.2 on rocky outcrops in the southern part of the lease area.

All of these REs have a management status of *No Concern at Present*. RE 1.3.7 (*Eucalyptus camaldulensis* (river red gum) woodland) has a biodiversity status of *Endangered*. The remaining REs carry a biodiversity status of *No Concern at Present*.

None of the REs have any equivalency with threatened ecological communities listed under the EPBC Act.

0 100 200 300 400 500
m

LEGEND

RE 1.3.7 (*Eucalyptus camaldulensis*
(river red gum) woodland)

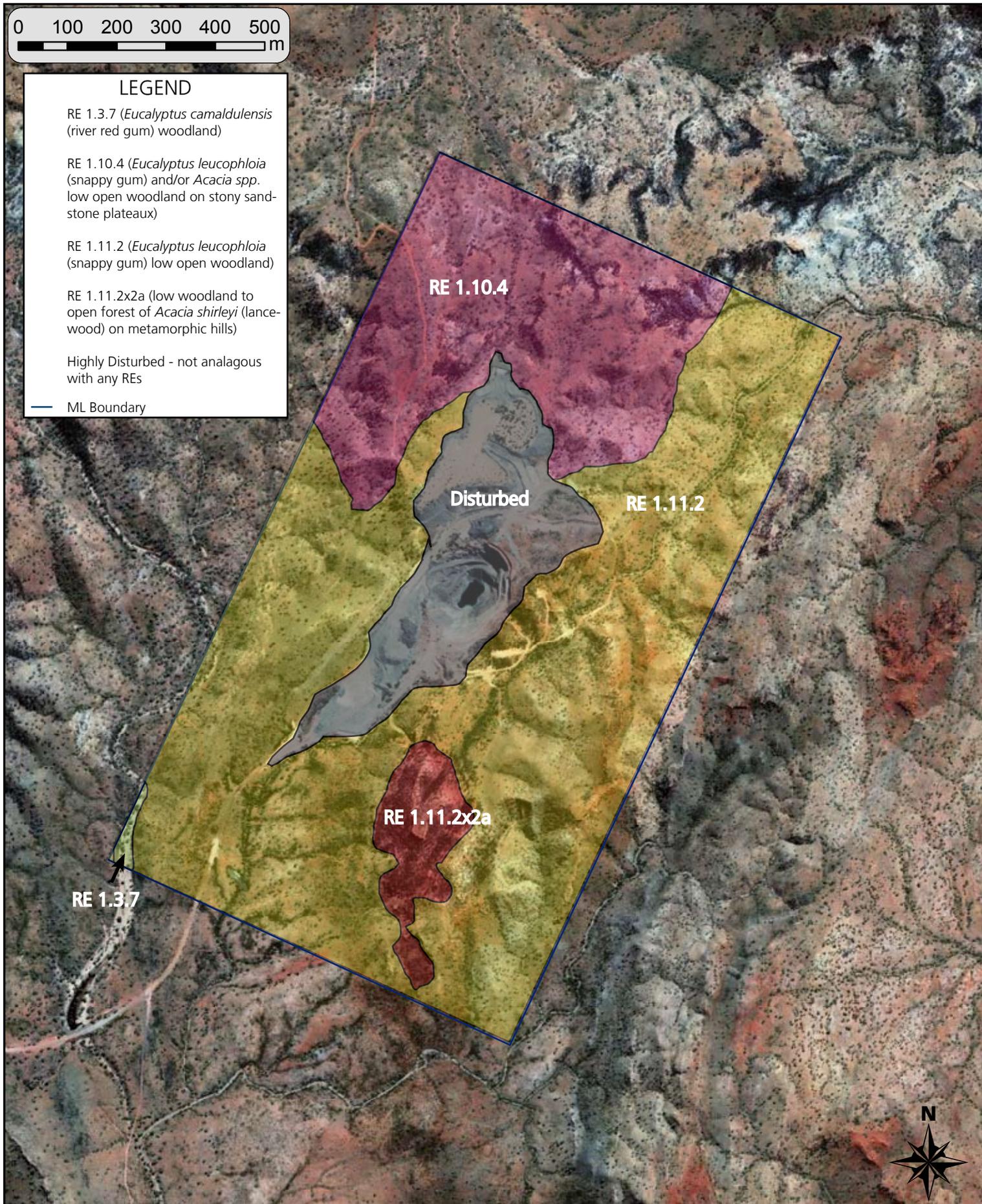
RE 1.10.4 (*Eucalyptus leucophloia*
(snappy gum) and/or *Acacia spp.*
low open woodland on stony sand-
stone plateaux)

RE 1.11.2 (*Eucalyptus leucophloia*
(snappy gum) low open woodland)

RE 1.11.2x2a (low woodland to
open forest of *Acacia shirleyi* (lance-
wood) on metamorphic hills)

Highly Disturbed - not analogous
with any REs

— ML Boundary



3.5.2.3 Fauna

Habitats

The Mount Ella ML has been subject to previous mining activities. The majority of this disturbance is localised and focused on a very deep extraction pit containing acidic water, access trails and rock/tailings pile.

There are a number of elongated rocky ridgelines containing numerous small and large crevices and caves. These areas provide quality shelter habitat for a range of small to large terrestrial fauna. Areas of higher peaks are surrounded by steeper sloping foot hills with a dense groundcovers and sparse canopy vegetation. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and passerine avifauna.

A number of higher slope gullies aligned with drainage lines from the upper slopes. These areas have a very rocky surface on fine alluvial sands, and are dominated by dense clumps of medium sized *Triodia molesta* (pincushion spinifex) and *Acacia chisholmii* (Chisholm's wattle) stands. These areas provide high quality forage and shelter habitat for cryptic avifauna and small terrestrial mammals, as well as corridor connectivity from higher slopes to flatter plains. The higher slope gullies flow into a lower ephemeral drainage line. This drainage line is dominated by small to medium *Triodia molesta* (pincushion spinifex) clumps and occasional *Acacia chisholmii* (Chisholm's wattle) on fine alluvium sands covered in stones and pebbles. This area provides further corridor connectivity and forage and shelter habitat for small terrestrial fauna and avifauna.

Fauna Species of Conservation Significance

The presence of rocky knolls, steep foothills and drainage lines provides potential habitat for *Acanthopis antarcticus* (common death adder) which is *Near Threatened* (NC Act). This species is likely to utilise the dense *Triodia molesta* (pincushion spinifex) within the majority of the Investigation Area, however better foraging habitat is associated to the rocky knolls, steep foothills and drainage lines.

Scattered canopy trees and groundcovers of *Triodia molesta* (pincushion spinifex) and other grasses which dominate the ML are likely to be utilised as movement or forage habitat by the *Near Threatened Heteromunia pectoralis* (pectorella manikin).

Remnant trees and higher rocky escarpments and open plain areas are likely to comprise forage and nesting habitat for the *Near Threatened Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite) (NC Act).

Rocky escarpments may provide suitable roosting habitat for the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act) and *Vulnerable Macroderma gigas* (ghost bat) (NC Act). There is potential shelter habitat for the *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby) which has been noted within the locality.

Pests

It is highly likely that the full suite of pest species found within the locality would persist within the ML.

3.5.2.4 Conclusions and Recommendations

Due to the timing of the most recent survey efforts, it is recommended that detailed wet season surveys be carried out to ascertain any seasonal variance in both flora and fauna assemblages.

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Lady Ella ML. A more thorough, detailed vegetation

survey utilising Differential GPS mapping will definitively ascertain the presence/absence of species of conservation significance, as well as enable the mapping of the complete extent of RE 1.3.7.

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities in the event of any further mining activities.

Further investigations into the use of remnant areas of this site are recommended prior to the commencement of any further mining works out side of the current disturbance areas. It is unlikely that any threatened fauna species noted above would be impacted by the recommissioning of the extraction pit.

Future works which disturb any noted habitat containing caves and crevices may potentially impact upon populations of the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act). It is recommended that detailed surveys be conducted throughout proposed disturbance area to ensure no populations are impacted upon.

3.5.3 Mount Dore

3.5.3.1 Present Status

The Mt Dore ML group comprises of seven Lease Areas. Mt Dore 1 has been subject to extensive dry season survey efforts to map all the Mt Dore 1 RE's and habitat areas. The remaining six leases were rapidly investigated to define the RE's and habitat types present.

The central and northern portions of this area are currently subject to exploration mining activities, with the remainder of the site intersected with associated infrastructure and access trails. Although predominantly sparse, the existing undisturbed vegetation across the remainder of the site is in excellent condition, and was assessed along with the disturbed areas as part of this survey to identify all Regional Ecosystems and flora species of conservation significance present. Survey effort was augmented with a total flora species count within Mt Dore 1, where ICM propose to construct a Decline Area with associated infrastructure. **Figure 11** illustrates the RE's present within the Mt Dore MLs.

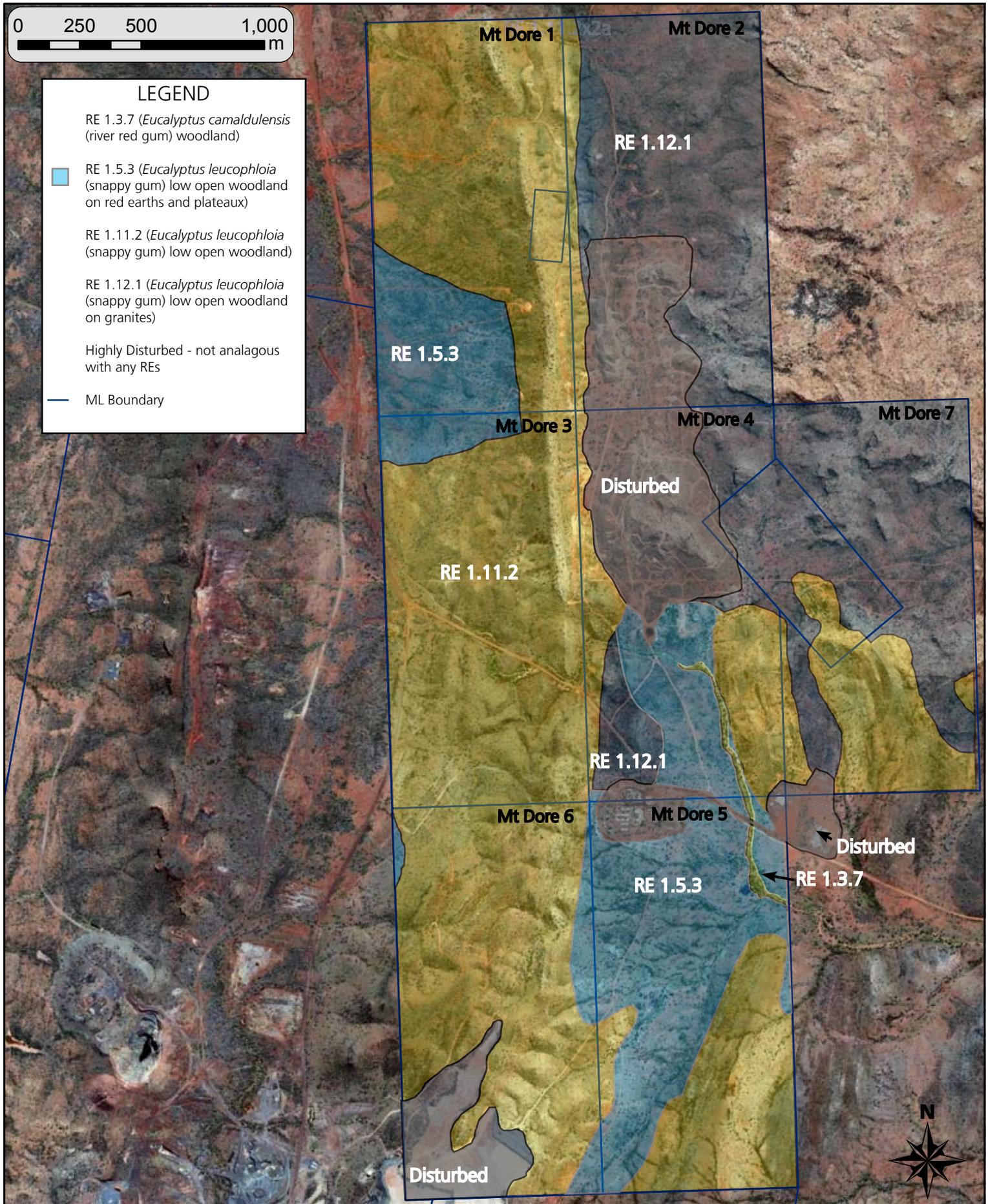
Habitat assessments of the Mt Dore ML's were conducted to investigate specific habitat values attributed to the topography, vegetative conditions and previous disturbance extents. These surveys involved both vehicular and foot traverses by two ecologists to inspect all habitat types across the ML. Aerial photography was also used to aid this assessment to allow an informed interpretation of habitats that are inaccessible by vehicle and foot. Intense spotlighting was conducted, as well as investigations in cave and ridge line areas.

Mt Dore 1 ML was subject to intensive fauna investigations involving a large suite of fauna detection methodologies for the assessment of the Decline Area. Please refer to **Appendix G** for full details of the employed fauna survey techniques.



LEGEND

- RE 1.3.7 (*Eucalyptus camaldulensis* (river red gum) woodland)
- RE 1.5.3 (*Eucalyptus leucophloia* (snappy gum) low open woodland on red earths and plateaux)
- RE 1.11.2 (*Eucalyptus leucophloia* (snappy gum) low open woodland)
- RE 1.12.1 (*Eucalyptus leucophloia* (snappy gum) low open woodland on granites)
- Highly Disturbed - not analogous with any REs
- ML Boundary



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**FIGURE 11:
 VEGETATION COMMUNITIES OF
 THE MT DORE MLS
 BASELINE ECOLOGICAL REPORT**

DATE: 15/11/2010
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 SCALE: 1:20,000 @ A4

3.5.3.2 Vegetation and Regional Ecosystems

Plants

Flora Species of Conservation Significance

No flora Species of Conservation Significance listed under either the NC Act or the EPBC Act were recorded within this ML.

Weeds

No declared LP Act weed species were detected.

Regional Ecosystems

Four RE's have been indentified within the MT Dore group which include RE1.3.7, RE1.5.3, RE 1.11.2 and RE1.12.1.

All of these REs have a management status of *No Concern at Present*. RE 1.3.7 (*Eucalyptus camaldulensis* (river red gum) woodland) has a biodiversity status of *Endangered*. The remaining REs carry a biodiversity status of *No Concern at Present*.

None of the REs have any equivalency with threatened ecological communities listed under the EPBC Act.

3.5.3.3 Fauna

Habitat

Areas of the Mount Dore ML's are subject to current mining structures and exploration. The majority of these disturbance areas contain limited habitat and comprise of access roads, exploration areas and mining operation infrastructure.

There are a number of linear rocky escarpments and smaller rocky knolls containing a range of crevices. A distinct lack of cave habitat was noted within these ML's. The higher escarpment areas provide quality shelter habitat for a range of small terrestrial fauna. These areas of higher rocky escarpments are surrounded by steeper sloping foot hills and incised gullies with dense groundcovers and sparse canopy vegetation on very rocky surfaces. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and avifauna.

A high number of smaller incised higher slope gullies aligned with drainage lines from the upper slopes are present. These areas have a very rocky surface on fine alluvial sands, and are dominated by dense clumps of *Triodia molesta* (pincushion spinifex) and *Acacia chisholmii* (Chisholm's wattle). These areas provide high quality forage and shelter habitat for cryptic avifauna and small terrestrial mammals, as well as corridor connectivity from higher slopes to flatter plains. The higher slope gullies flow into a number of large riparian channels and narrow lower alluvial drainage lines that dissect the ML provide potential corridor connectivity throughout the landscape, as well as high quality forage, nesting and movement habitat for a range of mammal, reptile, amphibian and avifauna.

A detailed fauna and habitat survey was conducted within the Mount Dore 1 ML. Full details on methodologies, results and recommendations are provided in **Appendix A** and **Appendix G**. Three threatened fauna species were noted during these surveys being the *Near Threatened Falco hypoleucos* (grey falcon), *Lophoictinia isura* (square-tailed kite) (NC Act) and the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act).

Fauna Species of Conservation Significance

The presence of rocky knolls, steep foothills and drainage lines provides potential habitat for the *Near Threatened Acanthopis antarcticus* (common death adder) (NC Act). This species is likely to utilise the dense *Triodia molesta* (pincushion spinifex) within the majority of the Investigation Area, however better foraging habitat is associated to the rocky knolls, steep foothills and drainage lines.

Scattered canopy trees and groundcovers of *Triodia molesta* (pincushion spinifex) and other grasses which dominate the ML are likely to be utilised as movement or forage habitat by the *Near Threatened Heteromunia pectoralis* (pectorella manikin).

Higher rocky escarpments, open plain areas and a permanent freshwater area are likely to comprise forage habitat for the *Near Threatened Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite) (NC Act).

Rocky escarpments may provide suitable roosting habitat for the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (NC Act) and *Vulnerable Macroderma gigas* (ghost bat) (NC Act), as well as shelter habitat for the *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby).

Pests

It is highly likely that the full suite of pest species found within the locality would persist within the ML. Smaller terrestrial mammal species not readily visible are likely to occur in higher densities in the disturbed mining operation areas.

3.5.3.4 Conclusions and Recommendations

Due to the timing of the most recent survey efforts, it is recommended that detailed wet season surveys be carried out to ascertain any seasonal variance in both flora and fauna assemblages.

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Mt Dore ML group. A more thorough, detailed vegetation survey utilising Differential GPS mapping will definitively ascertain the presence/absence of species of conservation significance, as well as enable the mapping of the complete extent of RE 1.3.7.

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities in the event of any further mining activities.

No threatened fauna species noted above are solely reliant on the Mt Dore ML for their persistence in the locality; however it should be noted that these ML's form a part of their greater habitat matrix. Current and proposed mining activities are unlikely to impact on these aforementioned significant species given the previous disturbance throughout the ML's and lack of critical habitat present for these species.

Any future clearing activities should consider the potential for nesting threatened raptor species. Given the increased vehicular activity (in particular larger trucks) it is recommended that fauna carcasses are removed from roads to minimise strike to fauna foraging on any carrion.

3.5.4 Selwyn

3.5.4.1 Present Status

Three (3) MLs comprise the Selwyn ML group. The central and southern portions of this area (Selwyn 1) show evidence of large-scale historical mining disturbance and are also currently subject to exploration mining activities and associated disturbances. The

remainder of the Selwyn MLs remain relatively undisturbed. **Figure 12** Illustrates the Regional Ecosystems of the Selwyn ML group.

The southern areas of the Selwyn 1 ML currently have a large rock dump, which supports large boulders piles creating a network of tunnel and cave style habitats. The existing undisturbed vegetation across the remainder of the site is in excellent condition, and was assessed along with the disturbed areas as part of this survey to identify all Regional Ecosystems and flora species of conservation significance present.

Habitat assessment of the Selwyn ML's were conducted to investigate specific habitat values attributed to the topography, vegetative conditions and previous disturbance extents. These surveys involved both vehicular and foot traverses by two ecologists to inspect all habitat types across the ML. Aerial photography was also used to aid this assessment to allow an informed interpretation of habitats that are inaccessible by vehicle and foot. Spotlighting was conducted, as well as investigations throughout cave and ridge line habitat types. Mining structures were investigated via head torches diurnally. Dawn and dusk surveys were conducted around dam areas within the ML.

3.5.4.2 Vegetation and Regional Ecosystems

Plants

Flora Species of Conservation Significance

No flora Species of Conservation Significance listed under either the NC Act or the EPBC Act were recorded within the Selwyn group.

Weeds

No declared LP Act weed species were detected within the Selwyn group.

Regional Ecosystems

Four RE's have been indentified within the Selwyn Group which include RE1.3.7, RE1.5.3, RE 1.11.2 and RE1.12.1.

All of these REs have a management status of *No Concern at Present*. RE 1.3.7 (*Eucalyptus camaldulensis* (river red gum) woodland) has a biodiversity status of *Endangered*. The remaining REs carry a biodiversity status of *No Concern at Present*.

None of the REs have any equivalency with threatened ecological communities listed under the EPBC Act.

0 500 1,000 1,500 2,000
m

LEGEND

RE 1.3.7 (*Eucalyptus camaldulensis*
(river red gum) woodland)

 RE 1.5.3 (*Eucalyptus leucophloia*
(snappy gum) low open woodland
on red earths and plateaux)

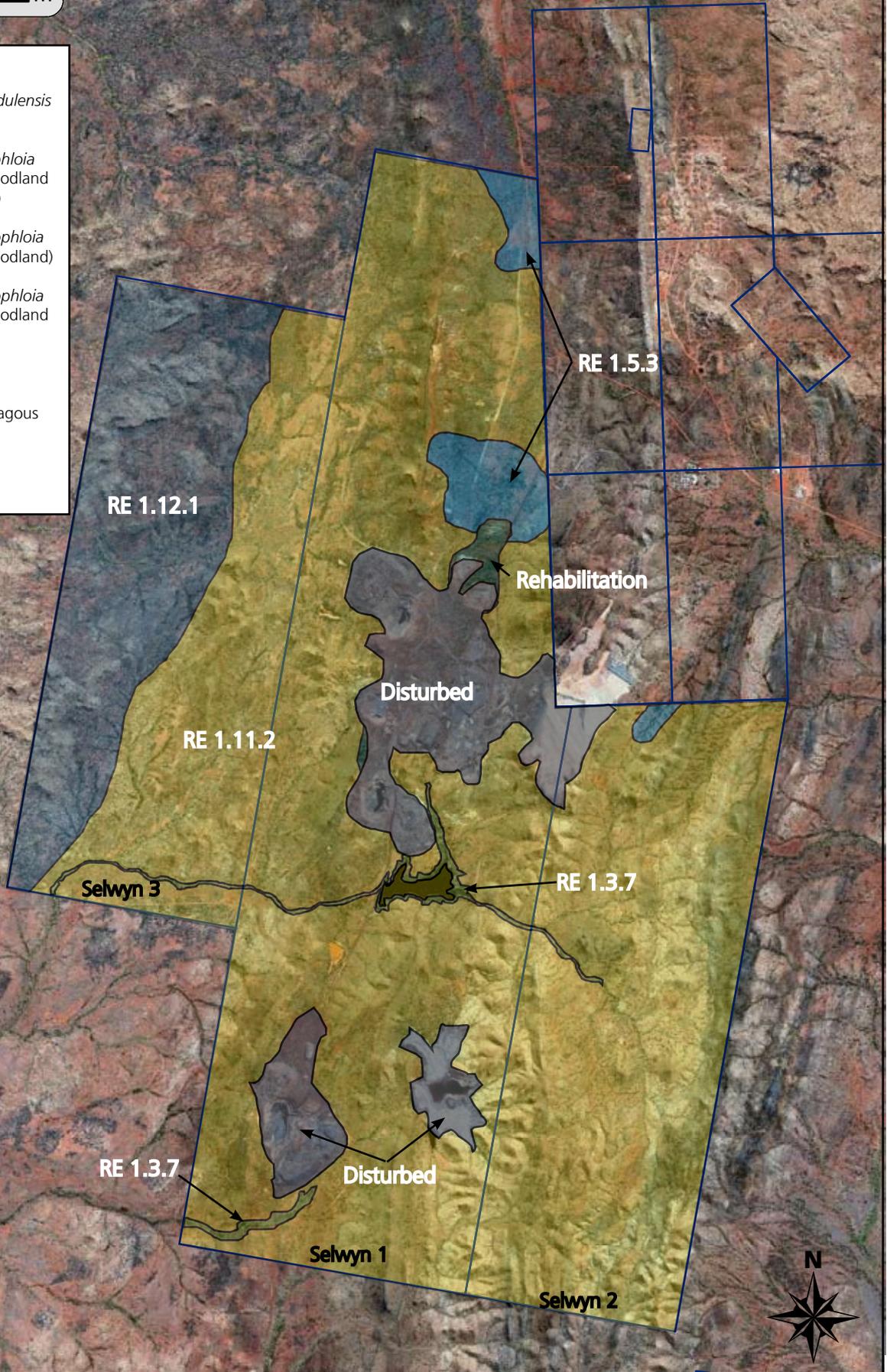
RE 1.11.2 (*Eucalyptus leucophloia*
(snappy gum) low open woodland)

RE 1.12.1 (*Eucalyptus leucophloia*
(snappy gum) low open woodland
on granites)

Rehabilitation

Highly Disturbed - not analogous
with any REs

 ML Boundary



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**FIGURE 12:
VEGETATION COMMUNITIES OF
THE SELWYN MLS
BASELINE ECOLOGICAL REPORT**

DATE: 15/11/2010
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3.5.4.3 Fauna

Habitat

The Selwyn ML's are extremely extensive and encompass a number of linear ridgelines and plain areas and modified habitat types. These ML's are subject to extensive past and current mining activities. The majority of this disturbance is void of vegetation and provides little habitat for fauna species. Waste rock dumps, freshwater dams, and old mining structures provide habitat for a range of fauna species.

There are a number of large ranges traversing the ML's in a north-south direction. These elongated rocky escarpments and smaller rocky knolls contain extensive small to large crevices and cave networks. These areas provide quality shelter habitat for a range of small to large terrestrial fauna. Areas of higher escarpments and ridgelines are surrounded by steeper sloping foot hills with a dense groundcovers and sparse canopy vegetation on very rocky surfaces. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and avifauna.

A number of higher slope gullies aligned with drainage lines from the upper slopes. These areas have a very rocky surface on fine alluvial sands, and are dominated by dense clumps of *Triodia molesta* (pincushion spinifex) and *Acacia chisholmii* (Chisholm's wattle). These areas provide high quality forage and shelter habitat for cryptic avifauna and small terrestrial mammals, as well as corridor connectivity from higher slopes to flatter plains. The higher slope gullies flow into numerous large riparian channels and narrow lower alluvial drainage lines that dissect the ML provide potential corridor connectivity throughout the landscape, as well as high quality forage, nesting and movement habitat for a range of mammal, reptile, amphibian and avifauna.

A number of dam areas have been created as a result of mining activities. These dam areas currently provide a permanent freshwater source and are fringed with dense *Eucalyptus camadulensis* (river red gum). These dam areas currently provide significant habitat for a wide variety of fauna species, in particular migratory wetland bird species and potentially the threatened *Petrogale purpureicollis* (purple-necked rock-wallaby). Across the majority of the region little permanent water sources exist, making the Selwyn Dams a significant water source for migratory species and endemic fauna. This fresh water coupled with dense *Eucalyptus camadulensis* (river red gum) fringing offers cryptic species shelter and forage areas.

Large rock dump areas associated with the southern extraction pit areas have provided a significant extent of artificial habitat for the threatened *Petrogale purpureicollis* (purple-necked rock-wallaby). A sub population of this species currently utilises the lower areas of this rock dump due to the larger boulders forming a complex matrix of tunnels and crevices that suite this species shelter requirements.

Fauna Species of Conservation Significance

The presence of rocky knolls, steep foothills and drainage lines provides potential habitat for the *Near Threatened Acanthopis antarcticus* (common death adder) (NC Act). This species is likely to utilise the dense *Triodia molesta* (pincushion spinifex) within the majority of the Investigation Area, however better foraging habitat is associated to the rocky knolls, steep foothills and drainage lines.

Higher rocky escarpments, remnant trees within riparian areas and slopes, open plain areas and a permanent freshwater area are likely to comprise forage and nesting habitat for the *Near Threatened Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite) (NC Act).

Rocky escarpments and old mining structures may provide suitable roosting habitat for the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) (EPBC Act) and

Vulnerable Macroderma gigas (ghost bat) (NC Act). as well as shelter habitat for the *Petrogale purpureicollis* (purple-necked rock-wallaby). *Petrogale purpureicollis* (purple-necked rock-wallaby) was also recorded sheltering permanently within waist rock dumps created by past mining overburden.

Pests

It is highly likely that the full suite of pest species found within the locality would persist within the ML. Smaller terrestrial mammal species not readily visible are likely to occur in higher densities in the disturbed mining operation areas.

3.5.4.4 Conclusions and Recommendations

Due to the timing of the most recent survey efforts, it is recommended that detailed wet season surveys be carried out to ascertain any seasonal variance in both flora and fauna assemblages.

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Selwyn ML group. A more thorough, detailed vegetation survey utilising Differential GPS mapping will definitively ascertain the presence/absence of species of conservation significance, as well as enable the mapping of the complete extent of RE 1.3.7.

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities in the event of any further mining activities.

The extensiveness of the Selwyn MLs result in a good representation of habitat types present in the locality. Higher quality habitat can be attributed a number of areas within the MLs however the most significant areas for species of conservation significance include the disturbed dam and rock dump areas, as well as the higher ridgelines and alluvial drainage lines supporting dense remnant *Eucalyptus camaldulensis* (river red gum).

It is recommended that where possible, disturbed areas that support populations of threatened species be retained and enhanced. These disturbed areas specifically relate to the dam areas that retaining high quality freshwater and the larger rock dumps areas that provide shelter habitat for the threatened *Petrogale purpureicollis* (purple-necked rock-wallaby).

Should the remediation of this rock dump be required, a management plan should be established for the sub population of *Petrogale purpureicollis* (purple-necked rock-wallaby) utilising the boulders at its base. Due to rock dump possessing a significant amount of finer tailing and soils at its peak, the remediation of this rock dump may potentially result in burying of the boulder habitat that provide caves and tunnels which support this sub population. Should works occur, scraping the higher tailings in the opposite direction from the larger boulders would be most appropriate. It would also be more beneficial to conduct works in a sequential order to ensure all *Petrogale purpureicollis* (purple-necked rock-wallaby) individuals move out of the disturbance areas. If possible rehabilitation of the tailings and fines should occur to provide a more naturalised habitat and stabilisation of the dump for future use.

It is recommended that any future mining activities outside of the currently disturbed areas consider more detailed surveys to ensure that no further impacts on the noted threatened species occurs.

Any future clearing activities should consider the potential for nesting threatened raptor species. Given the increased vehicular activity (in particular larger trucks) it is recommended

A noted population of *Vespidalus finlaysoni* (inland cave bat) was observed using a disused pipping network for roosting habitat. Should the piping be subject to future disturbance it is recommended that this population be captured and removed or works be conducted outside of breeding season and during the early hours of a warmer night to ensure least impact (potentially population will be foraging during this period).

3.5.5 Mount Cobalt

3.5.5.1 Present Status

The Mt Cobalt ML consists of a singular Mining Lease. The Mt Cobalt ML has been subject to historical mining disturbance which is concentrated along the east face of the central ridgeline. Predominantly sparse, the existing vegetation across the remainder of the site is in moderate condition, and was assessed as part of this survey to identify all Regional Ecosystems and flora species of conservation significance present. **Figure 12** illustrates the Regional Ecosystems of the Mt Cobalt ML.

Habitat assessments of the Cobalt ML's were conducted to investigate specific habitat values attributed to the topography, vegetative conditions and previous disturbance extents. These surveys involved both vehicular and foot traverses by two ecologists to inspect all habitat types across the ML. Aerial photography was also used to aid this assessment to allow an informed interpretation of habitats that are inaccessible by vehicle and foot. No spotlighting was conducted, nor were investigations throughout cave and ridge line habitat types due to lack of high quality habitat. Mining structures were investigated via head torches diurnally.

3.5.5.2 Vegetation and Regional Ecosystems

Plants

Flora Species of Conservation Significance

No flora Species of Conservation Significance listed under either the NC Act or the EPBC Act were recorded within the Mount Cobalt ML.

Weeds

No declared LP Act weed species were detected within the Mount Cobalt ML.

Regional Ecosystems

Two RE's have been identified within the Mount Cobalt ML; include RE1.5.3 and RE1.11.3

Both have a management status of *No Concern at Present* and a biodiversity status of *No Concern at Present*.

None of the REs have any equivalency with threatened ecological communities listed under the EPBC Act.

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m

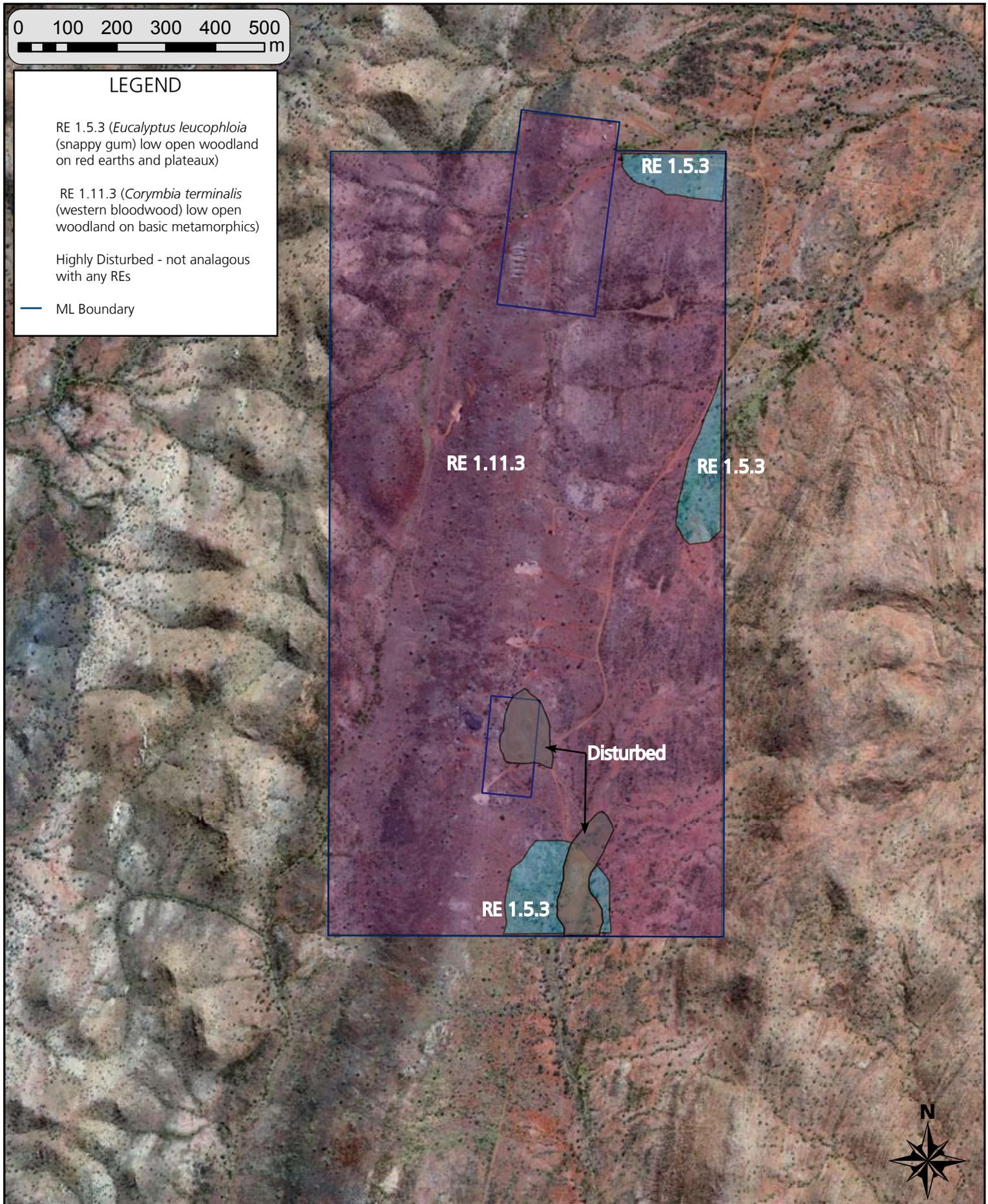
LEGEND

RE 1.5.3 (*Eucalyptus leucophloia*
(snappy gum) low open woodland
on red earths and plateaux)

RE 1.11.3 (*Corymbia terminalis*
(western bloodwood) low open
woodland on basic metamorphics)

Highly Disturbed - not analogous
with any REs

— ML Boundary



3.5.5.3 Fauna

Habitat

There are a number of a high steeper slopes and rocky ridges surrounded by steep foothills throughout the Cobalt ML. These areas contain rocky surfaces and a number of small boulder piles and crevices, which are likely to provide shelter habitat for small terrestrial fauna.

There is evidence of past and current disturbance throughout the ML. For the most part, areas containing access roads and previous mining structures are void of vegetation. Remains of previous mining operations provide potential habitat for of fauna species, including roosting mammals such as microchiropteran bats.

The majority of the ML is dominated by undulating hills containing little fauna habitat. There is a single large riparian channel and a number of narrow alluvial drainage lines that dissect the ML. These areas provide potential corridor connectivity throughout the landscape, as well as high quality forage, nesting and movement habitat for a range of mammal, reptile, amphibian and avifauna.

Fauna Species of Conservation Significance

The presence of rocky knolls, steep foothills and drainage lines provides potential habitat for the *Near Threatened Acanthopis antarcticus* (common death adder) (NC Act). This species is likely to utilise the dense *Triodia molesta* (pincushion spinifex) within the majority of the Investigation Area, however better foraging habitat is associated to the rocky knolls, steep foothills and drainage lines.

Scattered canopy trees and groundcovers of *Triodia molesta* (pincushion spinifex) and other grasses which dominate the ML are likely to be utilised as movement or forage habitat by the *Near Threatened Heteromunia pectoralis* (pectorella manikin).

Higher rocky knolls and foothill vegetation is likely to comprise nesting, forage and resting habitat for the *Near Threatened Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite) (NC Act).

Old mining structures and shafts provide suitable roosting habitat for the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat).

Pests

It is highly likely that the full suite of pest species found within the locality would persist within the ML. Small and medium sized terrestrial mammal species not readily visible are likely to occur in higher densities in the disturbed mining structure areas.

3.5.5.4 Conclusions and Recommendations

Due to the timing of the most recent survey efforts, it is recommended that detailed wet season surveys be carried out to ascertain any seasonal variance in both flora and fauna assemblages.

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Mt Cobalt Investigation Area. A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance.

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities in the event of any further mining activities.

The majority of the Mt Cobalt ML consists of undulating hills and broad plains. Disturbance areas throughout the ML have created artificial roosting habitat for threatened bat species, with little critical habitat for many of the noted threatened species.

The presence of retired mining shafts may potential support roosting habitat for the *Endangered Taphozous troughtoni* (Troughton's sheath-tail-bat) (NC Act). If present the sealing of old mining shafts or buildings may potentially result in the loss a known sub population of this species.

3.5.6 **Victoria**

3.5.6.1 **Present Status**

The Victoria ML consists of a singular Mining Lease which has been subject to historical mining disturbance. Vegetation surveys consisted of a rapid investigation of broad regional ecosystems within the ML. This disturbance is concentrated in the south of the site. Predominantly sparse, the existing vegetation across the remainder of the site is in good condition, and was assessed as part of this survey to identify all Regional Ecosystems and flora species of conservation significance present. **Figure 14** illustrates the Regional Ecosystems present within the Victoria ML.

Habitat assessments of the Cobalt ML's were conducted to investigate specific habitat values attributed to the topography, vegetative conditions and previous disturbance extents. These surveys involved both vehicular and foot traverses by two ecologists to inspect all habitat types across the ML. Aerial photography was also used to aid this assessment to allow an informed interpretation of habitats that are inaccessible by vehicle and foot. No spotlighting was conducted, nor were investigations throughout cave and ridge line habitat types due to lack of high quality habitat. Mining structures were investigated via head torches diurnally.

3.5.6.2 **Vegetation and Regional Ecosystems**

Plants

Flora Species of Conservation Significance

No flora Species of Conservation Significance listed under either the NC Act or the EPBC Act were recorded within the Mount Cobalt ML.

Weeds

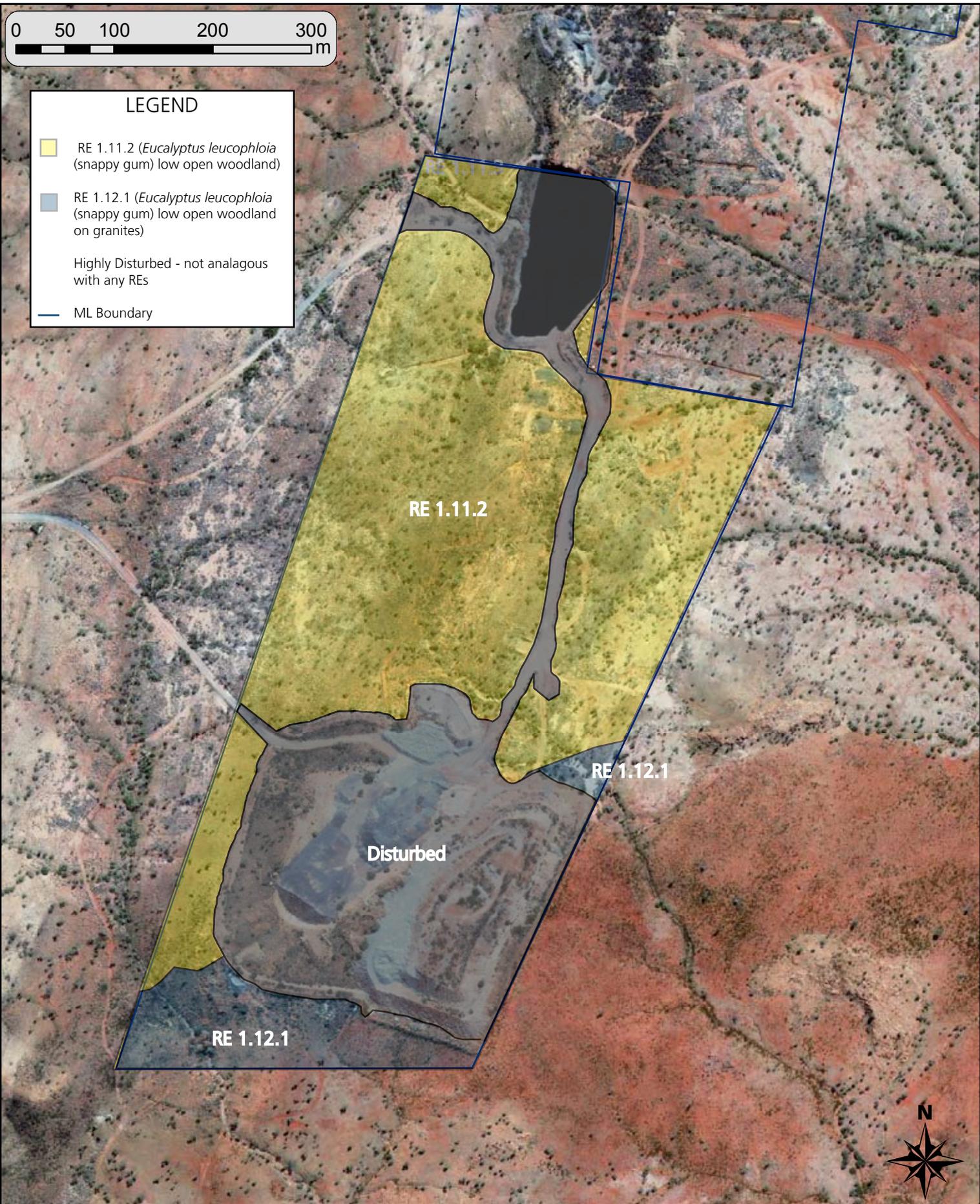
No declared LP Act weed species were detected within the Mount Cobalt ML.

Regional Ecosystems

Two RE's have been identified within the Mount Cobalt ML; include RE1.11.2 and RE1.12.1.

Both have a management status of *No Concern at Present* and a biodiversity status of *No Concern at Present*.

None of the REs have any equivalency with threatened ecological communities listed under the EPBC Act.



**FIGURE 14:
VEGETATION COMMUNITIES OF
THE VICTORIA ML
BASELINE ECOLOGICAL MINE REPORT**

Flora Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded within the Mt Cobalt Investigation Area.

Weeds

With reference to Queensland's LP Act, no declared weed species occur within the Mt Cobalt Investigation Area.

3.5.6.3 Fauna

Habitat

The Victoria ML has been subject to previous mining activities. For the most part these areas are void of vegetation and provide little habitat, however mineral extraction has resulted in the presence of a large rectangular pit, which currently holds a significant amount of good quality freshwater.

The highest quality habitat throughout the ML exists in higher rocky knolls and small to medium sized ephemeral drainage lines. These rocky knolls contain exposed rocky outcrops supporting crevices, which provide shelter and forage habitat for a number of smaller terrestrial species that inhabit the locality. Drainage lines support a moderate canopy cover which consists mostly of *Eucalyptus leucophloia* (snappy gum). The northern most of these drainage lines drains directly into the extraction pit, and supports substantial vegetation which provides higher quality habitat for fauna. Drainage lines that support areas of rocky incised banks provide high quality habitat for small terrestrial fauna.

Fauna Species of Conservation Significance

The presence of rocky knolls, steep foothills and drainage lines provides potential habitat for the *Near Threatened Acanthopis antarcticus* (common death adder) (NC Act).

Permanent freshwater sources are likely to be utilised by a number of species of conservation significance confirmed to be in the locality. The *Near Threatened Heteromunia pectoralis* (pectorella manikin) (NC Act), and *Vulnerable Petrogale purpureicollis* (purple-necked rock-wallaby) (NC Act) are likely to utilise this water source.

Higher rocky knolls and areas surrounding permanent freshwater are likely to comprise forage and resting habitat for the *Near Threatened Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite) (NC Act). Additionally, it is likely that the *Endangered Taphozous troughtoni* (Troughton's sheath-tail bat) would utilise these areas as a component of its' large foraging range.

Pests

It is highly likely that the full suite of pest species found within the locality would persist within the ML.

3.5.6.4 Conclusions and Recommendations

It is highly recommended that additional, smaller-scale; surveys are carried out prior to any further development within the Lady Ella ML. A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance.

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities in the event of any further mining activities.

It is unlikely that the majority of species of conservation significance would be significantly impacted upon should mining activities be re-commissioned within the ML. Further detailed investigations into the usage of higher quality habitat by threatened species are recommended prior to any major extractive or clearing activities. It should be noted that removal of the freshwater source within the extraction pit may have an impact on species of conservation significance, including migratory birds species and *Heteromunia pectoralis* (pectorella manikin). Natural recruitment of native vegetation within the eastern rock pile should be encouraged given the current advanced state that this area presents.

REFERENCES

- AARC (2002), 'Lady Ella Flora and Fauna Report'. Prepared by Australasian Resource Consultants Pty LTD (AARC) for Selwyn Mines Pty LTD.
- AARC (2008), 'Cannington Life Extension – Initial Advice Statement'. Prepared by AARC for BHP Biliton Minerals Pty Ltd.
- AARC (2009), 'Cloncurry Copper Project – Purple-necked Wallaby Survey'. Prepared by AARC for Exco Resources Ltd.
- AXM (2009), 'Flora and Fauna Assessment of Merlin Dewatering Dam Site, Selwyn Mine, Qld'. Prepared by AXM Environmental for Ivanhoe Cloncurry Mines.
- Barrett. G., Silcocks. A., Barry. S., Cunningham. R and Rory Poulter, (2003). The New Atlas of Australian Birds. Royal Australian Ornithologists Union 2003.
- Bostock, Peter D & Holland, Ailsa E. (Eds.). 2007. Census of the Queensland Flora 2007. Queensland Herbarium, Environmental Protection Agency, Brisbane, Qld.
- Bureau of Mineral Resources, 1:100,000 scale AGSO Geology of the Selwyn Region Map (1983).
- Churchill, S. (2008) Australian Bats. Allen & Unwin, Crows Nest, New South Wales.
- Cogger, H.G. (1996) Reptiles & Amphibians of Australia. Reed International Books Australia Pty Ltd, Port Melbourne, Victoria.
- Department of Environment and Resource Management, Queensland Parks and Wildlife Service (2010), "Wildlife Online Extract" Accessed at http://www.derm.qld.gov.au/wildlife-ecosystems/wildlife/wildlife_online/ 21 June 2010.
- Department of Environment, Water, Heritage and the Arts (2010) "EPCB Act Protected Matters Report" Accessed at <http://www.environment.gov.au/erin/ert/epbc/index.html> 21 June 2010.
- Elsol, J. (1994) 'BHP Minerals Cannington Project Vegetation and Flora Survey'. John Miedecke and Partners Pty Ltd.
- EUCLID: Eucalypts of Australia. 2007. Centre for Plant Biodiversity Research, Collingwood, Vic. Hacker, J.B. 1990. A Guide to Herbaceous and Shrub Legumes of Queensland. University of Queensland Press, St.Lucia, Qld.
- Fanning, D C (1993), 'Fauna Survey of the Osborne Project area'. Unpublished Report to Placer Pacific Pty. Ltd.
- Grice, A. C (2006), 'The impacts of invasive plant species on the biodiversity of Australian rangelands', *The Rangeland Journal* 2006, 28(1) 27–35.
- Maslin, B.R. (Ed.) Wattle: Acacias of Australia. 2001. Australian Biological Resources Study, Canberra, ACT.
- Milson, Jenny. 2000. Pasture Plants of northwest Queensland. Dept. of Primary Industries, Brisbane, Qld.
- Milson, Jenny. 2000. Trees and Shrubs of northwest Queensland. Dept. of Primary Industries, Brisbane, Qld.

Moore, Philip. 2005. A Guide to Plants of Inland Australia. Reed New Holland, Frenchs Forest, NSW.

Morgan, G (1999) "Northwest Highlands" in Sattler, P and Williams, R (eds) (1999) "The Conservation Status of Queensland's Bioregional Ecosystems" Environmental Protection Agency.

Neldner VJ, Wilson BA, Thompson EJ and Dillewaard HA (2004) "Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 3.0.", Queensland Herbarium, Environmental Protection Agency, Brisbane.

Neldner VJ, Wilson BA, Thompson EJ and Dillewaard HA (2005) "Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 3.1.", Queensland Herbarium, Environmental Protection Agency, Brisbane.

Neldner, J (1991) "Vegetation Survey of Central Western Queensland – Mapsheet [1:250,000]"

PLACE (2006), 'Flora and Fauna Study between the Trekelano Leases and the Duchess to Phosphate Hill Road'. Prepared by PLACE Environmental for Placer Dome Australia.

PLACE (2008), 'Lucky Luke Satellite Operation – Flora and Fauna Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.

PLACE (2010), 'Lucky Luke Satellite Operation – Ecological Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.

QLD Government, State Development (2002), 'Selwyn Mines Expansion Project, Terms of Reference for an Environmental Impact Statement'. Selwyn Mines Limited.

Queensland Herbarium (2009) "Regional Ecosystem Description Database (REDD)". Version 6.0b Updated November 2009, (November 2009) (Department of Environment and Resource Management: Brisbane). Accessed 19 October 2010 http://www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems/how_to_download_redd.html

Sattler, P and Williams, R (eds). (1999) "The Conservation of Queensland's Bioregional Ecosystems." Environmental Protection Agency, Brisbane.

Sharp, Donovan et.al. 2002. AusGrass: Grasses of Australia. Australian Biological Resources Study, Canberra, ACT. Environmental Protection Agency, Brisbane, Qld.

Sharpe, P.R. 1986. Keys to Cyperaceae of Queensland. Botany Branch, Dept. of Primary Industries, Brisbane, Qld.

SRK (2010), 'Independent Technical Report on the Merlin Project Queensland'. Prepared by SRK Consulting for Ivanhoe Australia Ltd.

Strahan, R. (1995) The Mammals of Australia - Revised Edition. Reed Books Australia, Chatswood, New South Wales.

Van Dyck, S. and Strahan, R. (2008) The Mammals of Australia - Third Edition. Reed New Holland, New Holland Publishers (Australia) Pty Ltd, Sydney Australia.

Walker, J & Hopkins, M.S "Vegetation" in McDonald, R.C, Isbell, R.F, Speight, J.G, Walker, J. and Hopkins, M.S (1990) "Australian Soil and Land Survey Field Handbook (2nd Edition)" Inkata Press.

Wilford, J.R (2003), 'Selwyn District, Queensland', CRC LEME, Canberra.

Appendix A Detailed Flora and Fauna Assessment

1.0 ACCESS ROAD

1.1 Locality Description

The proposed Access Road is a 15 km, external extension of an existing internal Access Road (**Error! Reference source not found.**) which extends from Mt Dore to Selwyn. The new road will provide graded, unsealed access between the Selwyn pit in the north to the Lucky Luke Mining Lease (Barrick Osborne) in the south where it will join into an existing Access Road between the Lucky Luke Deposit and mineral processing facilities and Osborne Mine.

For the purposes of assessing ecological conditions and features along the proposed alignment, and to collect sufficient data to allow for subtle realignments should features of significance be identified, the alignment was buffered 50m either side of the centre line to create a 100m wide search area which was field validated. A further 50 m either side of the search are (200m wide corridor) was assessed by remote sensing through aerial photographic interpretation for the purposes of determining vegetation community and faunal habitat coverage.

The Access Road comprises a 15 km long road alignment, connecting the northern end of the Lucky Luke Access Road with the Mt Dore Mining Lease Area.

1.2 Attributes

The Queensland Geological Mapping Data (July 2008) indicates that two geologies occur within the Access Road – undifferentiated alluvium/colluvium (Land Zone 5 after Sattler and Williams 1999) and metamorphic rocks of the Kuridala Formation (Landzone 11, *ibid*). Owing to the scale of the geological mapping, and the small scale of the waterways present along the alignment, recent channel deposits and levees comprising active (stream) alluvium (Land Zone 3, *ibid*), which is confirmed by site survey as being present, is not mapped.

The topography of the Access Road is gently undulating, with several drainage lines transecting the site, flowing in a westerly direction towards the Mort River (**Figure 2**).

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation community over most of the Access Road. The shrub layer is dominated by species of the genera *Acacia* and *Senna*. The seasonally depauperate ground layer is predominantly dominated by *Triodia molesta* (pincushion spinifex). This can be separated into two REs based on geology; thus RE1.5.3 is found on colluvium and red soils and RE1.11.2e is present on metamorphic geologies.

Most drainage lines are dominated by a narrow *Eucalyptus camaldulensis* (river red gum) woodland which has a typically sparse shrub layer dominated by *Acacia chisholmii* (Chisholm's wattle) and a ground layer dominated by the exotic species **Pennisetum ciliare* (buffel grass). This is analogous with RE1.3.7.

This woodland tends to be one canopy tree width wide and is a hydrology-driven community; it highly dependent upon soil moisture availability. In contrast with the *Eucalyptus leucophloia* (snappy gum) woodland, groundlayer within 1.3.7 tends to be permanent, influenced by stream flow and the availability of moisture in the bed sands and gravels and banks of the watercourse. In smaller alluvial depressions the vegetation was dominated by *Acacia chisholmii* (Chisholm's wattle).

1.3 Sampling Approach

1.3.1 Flora

The objective of this survey was to:

1. Provide an inventory of flora species for the area scheduled for future disturbance;
2. Determine the presence/potential presence of threatened and/or locally significant species; and,
3. Align the Investigation Area's vegetation communities to prescribed regional ecosystems.

The area estimated to be disturbed as a result of the construction of the Access Road was surveyed by means of vehicular and foot traverses on the 17th September 2010. The following techniques were utilised:

1. The species specific survey methodology utilised for this site was a "walk-through/drive through, partial species" account; and
2. The structural composition of the site was assessed using "Sheet C: Vegetation structure –crown cover estimated, (as per "Request for Assessment of Regional Ecosystem Map, Version 5.0 (2006)", Queensland Herbarium, EPA, Brisbane.

Species percentage was not recorded, but instead the dominance of emergent, understorey and groundcover species were noted. Vegetation Communities were mapped based on existing geology mapping, observed floristic composition and condition. All major drainage lines were mapped on foot using a differential GPS and a species list for each recorded community was compiled, and is provided in **Appendix F**

1.3.2 Fauna

During the survey of the Access Road alignment, each change in habitat type was documented via Differential GPS and has been illustrated within **Figure 5**. Field survey efforts were focused on the 100m search area. In the field each habitat type was assessed for its potential to support fauna and specific investigations were carried out to search for habitat which may potentially support habitat for threatened fauna species noted to persist inhabit the locality.

1.4 Vegetation and Regional Ecosystems

1.4.1 Species

A combined total of 84 vascular plant species were recorded in the Access Road (**Appendix F**). This is a high proportion of the 92 species recorded across the entire Investigation Area, indicative of the significant impact of the proposed linear development.

1.4.2 Exotic and Declared Species

Of the 84 vascular plants recorded in the Access Road, 2 species or 2.4% are exotic species naturalised in Queensland (**Appendix F**). None of the species are declared weeds under the schedules of the LP Act.

1.4.3 Threatened Flora Species

No species listed as Near Threatened, Vulnerable or Endangered under the NC Act were identified in the Access Road Area. None of the flora species recorded during the field survey are listed under the NC Act or the EPBC Act.

1.4.4

Regional Ecosystems

Three regional ecosystems RE1.3.7, RE1.5.3 and RE1.11.2 represented spatially along the alignment (**Figure 4a-b**) are present along the Access Road alignment. RE1.11.2 is represented by a major vegetation community described by Queensland Herbarium (2009); RE1.11.2e.

All REs carry a vegetation management status of *Least Concern* and a Biodiversity status of *No Concern at Present* which are the lowest conservation significance.

None of these are considered threatened ecological communities at a national level under the EPBC Act.

A large area of highly disturbed land is present at the northern part of the alignment, in the vicinity of the open pit on Selwyn 1.

1.4.4.1

RE1.3.7 - *Eucalyptus camaldulensis* (river red gum) low woodland

Description

Occurs within a drainage line that bisects the proposed Access Road (**Figure 4a-4b**). This community typically occurs on recent levees and channel deposits of larger tributaries, primarily on alluvial soils.

Waterway H1

The canopy layer (2-7m) is sparse and is dominated by *Eucalyptus camaldulensis* (river red gum) with associated *Eucalyptus leucophloia* (snappy gum). The shrub layer (1-2m) is sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Eremophila maculata* (spotted fuchsia bush). Other species present include *Senna artemisioides* subsp. *oligophylla* (limestone cassia), *Eremophila longifolia* (berrigan) and *Senna notabilis* (cockroach bush). The ground layer (0-0.5m) is dense and is dominated by **Pennisetum ciliare* (buffel grass) with associated *Triodia molesta* (pincushion spinifex) and indigenous Poaceae species.

Waterway H2:

The canopy layer (2-9m) is sparse and is dominated by *Eucalyptus camaldulensis* (river red gum) with associated *Eucalyptus leucophloia* (snappy gum), *Corymbia terminalis* (western bloodwood) and *Grevillea striata* (beefwood). The shrub layer (0.5-2m) is sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Carissa lanceolata* (conker berry), *Acacia gonoclada*, *Eremophila longifolia* (berrigan), *Grevillea wickhamii* (holly leaved grevillea) and *Santalum lanceolatum* (sandalwood). The ground layer (0-0.5m) is dense and is co-dominated by **Pennisetum ciliare* (buffel grass) and *Triodia molesta* (pincushion spinifex) with associated *Themeda triandra* (kangaroo grass) and *Heteropogon contortus* (black spear grass).

Waterway H3

The canopy layer (2-8m) is sparse to very sparse and is dominated by *Eucalyptus camaldulensis* (river red gum). The shrub layer (0.5-2m) is sparse and dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Carissa lanceolata* (conker berry) and *Acacia gonoclada*. The ground layer (0-0.5m) is dense and is dominated by *Triodia molesta* (pincushion spinifex) with associated *Themeda triandra* (kangaroo grass), **Pennisetum ciliare* (buffel grass) and *Heteropogon contortus* (black spear grass).

Waterway H4

The canopy layer (2-9m) is sparse and is dominated by *Eucalyptus camaldulensis* (river red gum). The shrub layer (0.5-2m) is sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Carissa lanceolata* (conker berry), *Eremophila longifolia* (berrigan) and *Acacia gonoclada*. The ground layer (0-0.5m) is dense and is dominated by **Pennisetum ciliare* (buffel grass).

See **Appendix F** for the full species account.

Species of Conservation Significance

With reference to the NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this vegetation community. Suitable habitat exists for a number of threatened species known to occur in the area, and while the trees and shrubs are easily detectable year-round, certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs are not readily detectable during the dry season. It is therefore recommended that post-wet season surveys are undertaken to assess the presence or absence of these species in this vegetation community.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *Endangered*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.3.7 is considered *Endangered* under DERMs biodiversity assessment on account of regional degradation of this RE by high total grazing pressure (direct impacts associated with trampling, secondary impacts associated with exotic pasture species introductions principally **Pennisetum ciliare* (buffel grass) and tertiary impacts associated with altered fire regimes (arising from buffel grass which carries a greater biomass than undisturbed systems) and habitat alteration).

Natural examples of these systems do burn patchily due to low flammability and small fuel loads, however they should not be targeted for prescribed burning. This is particularly pertinent for waterways containing **Pennisetum ciliare* (buffel grass) which significantly contributes to the fuel load and exacerbates the vulnerability of these areas to fire.

Although these analogous REs fulfil criteria for remnant status, their extent within the landscape would generally make them too small to map at the scales utilised by DERM. Despite this they should be treated as functioning representations of RE1.3.7 and management considerations appropriate for them apply.

1.4.4.2 RE1.5.3 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on red earths on plateaus.

Description

Spatially covers 50% of the Access Road (**Figure 4a-4b**). Where the Access Road Area traverses the Selwyn MLs a large portion has been disturbed by mining activities. This area presents a mosaic pattern of small patches of surviving vegetation amidst the various disturbances associated with past and present mining activities.

Structure

The canopy layer (2-8m) is sparse to extra sparse and dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Corymbia terminalis* (western bloodwood) and *Acacia cambagei* (gidgee). Other species present include *Eucalyptus leucophylla* (Cloncurry box), *Eucalyptus normantonensis* (Normanton box), *Grevillea striata* (beefwood) and *Atalaya hemiglauca* (whitewood). The shrub layer (0.5-2m) is sparse to

extra sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia acradenia* (no common name), *Senna artemisioides* subsp. *oligophylla* (limestone cassia), *Carissa lanceolata* (conker berry), *Capparis lasiantha* (nipan) and *Eremophila longifolia* (berrigan). Other species present include *Senna glutinosa* subsp. *pruinosa* (silver cassia), *Acacia chippendalei* (Chipendale's wattle), *Santalum lanceolatum* (sandalwood), *Maytenus cunninghamii* (yellowberry bush) and *Eremophila maculata* (spotted fuchsia bush). The ground layer (0-0.5m) is dense and is dominated by *Triodia molesta* (pincushion spinifex) with associated *Aristida contorta* (bunched kerosene grass) and *Ptilotus schwartzii* (horse mulla mulla).

See **Appendix F** for the full species account.

Species of Conservation Significance

With reference to the NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this vegetation community. Suitable habitat exists for a number of threatened species known to occur in the area, and while the trees and shrubs are easily detectable year-round, certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs are not readily detectable during the dry season. It is therefore recommended that post-wet season surveys are undertaken to assess the presence or absence of these species in this vegetation community.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.5.3 occurs on undulating plateau surfaces; lateritic red earths, and small areas of shallow sandy loams and skeletal soils.

A number of drainage lines are present within this RE type. Whilst floristic diversity is much simplified when compared to that of the surrounding (broader RE) no major communities are recognised by the Queensland herbarium (2009) for this RE type.

Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every year, but also ensuring some patches are long unburnt. Annual burnt areas should be less than 30%.

1.4.4.3 RE1.11.2e - *Eucalyptus leucophloia* (snappy gum) low woodland to low open woodland on metamorphic geology.

The vegetation present along the Access Road is most similar to recognised major vegetation community RE1.11.2e which is described as (Queensland Herbarium., 2009) a Low open-woodland of *Eucalyptus leucophylla* (snappy gum) and *Eucalyptus leucophloia* (Cloncurry box) often with *Acacia cambagei* (gidgee) and *Corymbia terminalis* (western bloodwood) with a sparse ground layer of *Triodia* spp (Spinifex). RE1.11.2e occurs on footslopes and lower slopes, broken by creeks and drainages.

Description

This community occurs on almost half of the Access Road (**Figure 4a-b**). Where the Access Road traverses the Selwyn ML a large portion has been disturbed by mining activities. This area presents a mosaic pattern of small patches of surviving vegetation amidst the various disturbances associated with past and present mining activities.

Structure

The canopy layer (2-8m) is sparse to extra sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Corymbia terminalis* (western bloodwood) and *Acacia cambagei* (gidgee). Other species present include *Eucalyptus leucophylla* (Cloncurry box), *Eucalyptus normantonensis* (Normanton box), *Grevillea striata* (beefwood) and *Atalaya hemiglauca* (whitewood). The shrub layer (0.5-2m) is sparse to extra sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia acradenia*, *Senna artemisioides* subsp. *oligophylla* (limestone cassia), *Carissa lanceolata* (conker berry), *Capparis lasiantha* (nipan) and *Eremophila longifolia* (berrigan). Other species present include *Senna glutinosa* subsp. *pruinosa* (silver cassia), *Acacia chippendalei* (Chipendale's wattle), *Santalum lanceolatum* (sandalwood), *Maytenus cunninghamii* (yellowberry bush) and *Eremophila maculata* (spotted fuchsia bush). The ground layer (0-0.5m) is dense and is dominated by *Triodia molesta* (pincushion spinifex) with associated *Aristida contorta* (bunched kerosene grass) and *Ptilotus schwartzii* (horse mulla mulla).

See **Appendix F** for the full species account.

Species of Conservation Significance

With reference to the NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this vegetation community. Suitable habitat exists for a number of threatened species known to occur in the area, and while the trees and shrubs are easily detectable year-round, certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs are not readily detectable during the dry season. It is therefore recommended that post-wet season surveys are undertaken to assess the presence or absence of these species in this vegetation community.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

A number of drainage lines are present within this community type. Whilst these have been mapped as 1.11.2e, floristic diversity is much simplified than that of the surrounding landscape and whilst there may be merit in describing these as the separate community 1.11.2, they are too small to map as such.

Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

1.4.5 Summary of Effects

No significant environmental constraints were identified within the Access Road Area. The records of *Eucalyptus camaldulensis* (river red gum) are part of the vegetation community associated with a large dry river bed to the west of the proposed Access Road and are limited to the very western edge of the designated disturbance area. It is considered that no flora or fauna species, communities or ecosystems listed as significant under the NC Act, VM Act or EPBC Act will be adversely affected by the proposed development.

1.4.6 Recommendations

It is highly recommended that an Environmental Management Plan for the proposed Access Road be prepared before the commencement of construction works. This will serve as a guiding document to minimise the impact of the development on surrounding vegetation and mitigate the cumulative effects of the ongoing disturbance once the Access Road is in operation.

Construction management should include strategies to protect retained vegetation and minimise the disturbance caused by construction vehicles and topsoil/spoil piles. Where the Access Road crosses drainage lines, consideration should be given to maintaining landscape functionality and facilitating the natural movement of drainage paths and hence the dispersal of native flora species reliant on these features.

Operational management should include strategies to manage weed encroachment and control dust dispersal.

1.5 Fauna and Habitats

1.5.1 Habitats of the Access Road Alignment

The Access Road alignment predominately traverses large tracts of slightly undulating hills and flat plains. Habitats associated with the undulating hills of the Access Road are generally dominated by moderate densities of ground covers which ranged from small to medium *Triodia molesta* (pincushion spinifex) clumps on rocky surfaces. Occasional areas heavily dominated by stands of *Acacia chilsomii* (Chisholm's Wattle) occur as of find soils and sands on lower depressions creating a dense shrub layer. Canopy vegetation is typically sparse comprising *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). The lower flat plains provide little habitat structure, with numerous cleared patches of red soil and little canopy cover. These areas are primarily dominated by *Aristida contorta* (bunched kerosene grass) and occasional *Triodia molesta* (pincushion spinifex) clumps on very stony soils. These habitat types are unlikely to provide any critical habitat for fauna in the locality apart from movement and forage habitat for nomadic terrestrial mammals and avifauna.

The highest quality fauna habitat throughout the Access Road alignment exists in the riparian channels and lower drainage lines. There are a number of larger course alluvial channels which flow in a westerly direction dissecting the Access Road alignment. These channels are dominated by a canopy of *Eucalyptus camaldulensis* (river red gum) and banks of moderate to dense *Triodia molesta* (pincushion spinifex) clumps. There are numerous smaller lower alluvium drainage lines which dissect the Access Road alignment.

Predominately, these drainage lines extend from the aforementioned larger riparian channels of the Mort River and / or higher foothill gullies outside of the Access Road corridor. These drainage lines are generally dominated by *Triodia molesta* (pincushion spinifex) clumps and an occasional moderate density of *Acacia chisholmii* (Chisholm's wattle) on alluvium covered in small stones and pebbles.

This habitat is important seasonal water bird habitat, important denning and seasonal nesting habitat for hollow dependent fauna, and affords significant landscape corridors for fauna.

Detailed descriptions of habitat types present along the Access Road alignment are outlined within **Table 1**. The location of these habitat types are illustrated in **Figure 5**.

TABLE 1: FAUNA HABITAT TYPES OF THE ACCESS ROAD ALIGNMENT

Habitat Type	Composite RE's	Description	Habitat Quality
Undulating plains	1.5.3/1.11.2	Dominated by slightly undulating hills containing moderately dense ground covers of small to medium <i>Triodia molesta</i> (pincushion spinifex) clumps with occasional areas dominated by stands of <i>Acacia chilsomii</i> (Chisholm's Wattle). Canopy is predominately sparse comprising <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood), however can be void of vegetation in areas. Generally stony fine soils.	Moderate
Flat plains	1.11.2	The lower stony flats and plains provide little habitat structure, with numerous cleared patches of red soil and very little canopy cover. These areas are primarily dominated by <i>Aristida contorta</i> (bunched kerosene grass) and occasional <i>Triodia molesta</i> (pincushion spinifex) clumps on very stony soils.	Low-Moderate
Riparian channels	1.3.7	These habitats are generally dominated by sporadic mature <i>Eucalyptus camaldulensis</i> (river red gum) reaching a height of 15 - 10 m. The shrub layer consists of sparse <i>Acacia chilsomii</i> (Chisholm's Wattle) and <i>Acacia cambagei</i> (gidgee) with a dense groundcover of <i>Triodia molesta</i> (pincushion spinifex) and fallen branches. Soil is generally coarse alluvium and clay.	High
Lower alluvial drainage lines	1.5.3	Dominated by medium to large <i>Triodia molesta</i> (pincushion spinifex) clumps and occasional areas containing stands of dense <i>Acacia chilsomii</i> (Chisholm's Wattle) and <i>Acacia cambagei</i> (gidgee). Contains sparse canopy species in areas comprising of <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood). Soils vary from areas of fine sands to areas covered with small stones and pebbles.	Moderate - High

1.5.2 Sampling Effort

The entire Access Road alignment was traverse by vehicle and on foot by two ecologists over an 8 hour period. This assessment allowed a detailed inspection and documentation of all habitat types that are supported within the alignment. Details of sampling effort for each technique are contained in **Appendix G**.

1.5.3 Site Survey Data and Threatened Species

1.5.3.1 Amphibians

The highest quality habitat for amphibians exists in the riparian channels and lower alluvial drainage line that dissect the Access Road alignment. Owing to the presence of suitable breeding and foraging habitats within these areas, it is likely that many of the

species recorded by previous surveys (**Appendix E**) could be expected to occur along the Access Road, particularly during and after the wet season. These species include *Litoria caerulea* (green tree frog), *Litoria rubella* (desert tree frog), *Cyclorana australis* (water holding frog), and *Opisthodon ornatus* (ornate burrowing frog). It is considered unlikely that the Access Road will reduce any critical habitat required by any amphibian species; however measures should be taken to minimise Road crossing within these lower channels and drainage lines, or piping used to bridge the larger channels.

Database searches and previous surveys have not recorded any threatened amphibian species in the locality.

1.5.3.2 Reptiles

The majority of the Access Road alignment is concentrated within habitat types considered to be of moderate to high quality habitat for reptile species representing the families: Agamidae, Scincidae, Elapidae and Varanidae (**Appendix E**). This is owing to the presence of a variety of habitat types, including vast amount of open flatter rocky plains dominated primarily by sparse clumps of *Triodia molesta* (pincushion spinifex). While it is likely that reptile species utilise a range of habitat types along the Access Road alignment for movement, the highest quality reptile habitat is associated with riparian areas and lower drainage lines with dense understoreys, fallen timber and debris from floods, and rocky or softer soils. These areas provide corridor connectivity across the landscape, as well as forage and shelter habitat. Additional high quality habitat for reptiles in the locality is higher rocky foothills and escarpments containing shelter and abundance prey species (small terrestrial mammals) which are located outside of the Access Road alignment.

The Near Threatened *Acanthophis antarcticus* (common death adder) is likely to persist within habitats present along the Access Roads alignment. Given the lack of rocky structures such as escapements, it is unlikely that the proposed Access Road alignment will significantly impact upon this species.

1.5.3.3 Birds

The Access Road alignment supports a number of habitat types (**Table 1**) suitable for a diverse suite of avifauna species.

Migratory birds

Riparian areas provide the highest quality movement and forage habitat for migratory avifauna species throughout the Access Road alignment. It is likely that these areas are utilised for foraging by *Merops ornatus* (rainbow bee-eater) and *Apus pacificus* (fork-tailed swift).

There is the potential that migratory wetland species *Ardea ibis* (cattle egret) and *Egretta alba* (great egret) could use riparian channels for movement and temporary forage habitat during and after wet season. Despite this, these areas are unlikely to constitute critical habitat for these species' due to the availability of nearby larger permanent wetland areas associated with the Mort River and dams.

Further to this, the other six (6) migratory species identified as occurring or potentially occurring in the locality (**Appendix C**), including *Glareola maldivarum* (oriental pranticole), *Haliaeetus leucogaster* (white-bellied sea-eagle), *Charadrius veredus* (oriental plover), *Rostratula benghalensis* (painted snipe), and *Rostratula australis* (Australian painted snipe). The *Rostratula australis* (Australian painted snipe) and is listed as vulnerable under the EPBC Act and NC Act. The migratory nature of these species, coupled with their strong association with waterways and riparian areas, means that any disturbance to the Access Road is unlikely to impact on any critical habitat for these species'.

Passerine Birds

Riparian forested channels and undulating plains containing canopy and dense mid-strata vegetation comprised the highest quality habitat for a large suite of avifauna within the Access Road alignment. The Access Road alignment dissects a range of habitat types for smaller passerine bird species. Passerine species were noted in all habitat types during surveys, including riparian channels and open plains containing larger and denser clumps of *Triodia molesta* (pincushion spinifex).

It is likely that riparian channels provide potential movement and forage habitat for the *Heteromunia pectoralis* (pectorella manikin) (NC Act), however higher quality habitat is more evident in nearby areas associated with old growth *Eucalyptus camaldulensis* (river red gum) and post rain water along the Mort River.

Diurnal Raptors

Highest quality nesting habitat for the majority of diurnal raptors is associated with mature vegetation alongside rivers, riparian channels and sloping rocky ridges. There are also some species that require dense low-lying vegetation for ground nesting, including the *Circus assimilis* (spotted harrier). Although, the Access Road alignment traverses good open plain foraging habitat dominated by *Triodia molesta* (pincushion spinifex) clumps, there is little of the mature vegetation present to provide high quality nesting for diurnal raptors. Incised riparian channels contain the greatest potential canopy vegetation (*Eucalyptus camaldulensis* (river red gum)) for diurnal raptors nesting along the Access Road alignment. It is likely that a range of raptor species forage over the Access Road alignment, including *Aquila audax* (wedge-tailed eagle); *Milvus migrans* (black kite), *Falco berigora* (brown falcon), *Falco peregrinus* (peregrine falcon), and *Falco longipennis* (Australian hobby), *Lophoictinia isura* (square-tailed kite) and *Falco hypoleucos* (grey falcon).

In addition, a greater number of infrequently recorded diurnal raptor species, including *Hamirostra melanosternon* (black-breasted buzzard) *Elanus scriptus* (letter-winged kite), *Elanus axillaris* (black shouldered kite), *Circus approximans* (swamp harrier), *Hieraaetus morphnoides* (little eagle), and *Accipiter fasciatus* (brown goshawk) are also likely to forage over the habitats of the Access Road alignment.

High quality habitat for diurnal raptor species is common throughout the locality with large trees lining dam areas, riparian channels, incised drainage lines, high rocky outcrops coupled with abundant prey species. Furthermore, diurnal raptor species often have extensive home ranges encompassing a matrix of foraging, roosting and breeding habitats. It is therefore unlikely that the Access Road will significantly impact on the critical habitat of these species'.

Nocturnal Birds

The highest quality habitat along the Access Road alignment exists in the riparian channels associated with larger canopy *Eucalyptus camaldulensis* (river red gum). These areas provide potential for nesting resources, including hollows, as well as forage habitat for a range of nocturnal birds recorded in the locality, including *Aegotheles cristatus* Australian owl-nightjar, *Ninox connivens* (barking Owl), *Ninox novaeseelandiae* (southern boobook), *Tyto alba* (barn owl) and *Podargus strigoides* (tawny frogmouth). These areas also provide habitat for the *Nycticorax caledonicus* (nankeen night-heron) which was observed during recent surveys within these channels.

For the most part, the Access Road alignment contains relatively low quality nocturnal bird habitat compared to surrounding areas associated with old growth *Eucalyptus camaldulensis* (river red gum) along larger riparian areas, and sloping foothill containing caves and crevices in surrounding escarpments.

1.5.3.4

Mammals

Open plains dominated by *Triodia molesta* (pincushion spinifex) or *Aristida contorta* (bunched kerosene grass) with a sparse canopy cover of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) are present throughout the majority

of the Access Road alignment. These habitat types provide forage habitat for the larger common terrestrial mammalian species, including *Macropus rufus* (red kangaroos), *Macropus giganteus* (eastern grey kangaroo), *Onychogalea unguifera* (northern nailtail wallaby) and *Macropus robustus* (common wallaroos). The relatively high abundance and nomadic nature of these species' means that loss of habitat along the Access Road is unlikely to cause a detrimental effect on critical habitat required by populations within the locality. The Access Road alignment does not directly impact on rocky outcrop habitats preferred by the *Petrogale purpureicollis* (purple-necked rock-wallaby) which has been recorded in the Investigation Area. This species was recorded during recent surveys in nearby disturbed rock dumps created by previous mining overburden.

It should be noted that an increase in vehicular strike on larger terrestrial mammals does pose a threat to individuals. Fauna management should be implemented to avoid vehicular strikes and if required remove carcasses from the Access Road.

The highest quality habitat for small mammals along the Access Road alignment is associated with riparian channels and lower alluvial drainage lines that contain dense understorey layers, comprising mature *Triodia molesta* (pincushion spinifex) clumps, areas of dense *Acacia chilsomii* (Chisholm's Wattle) and *Acacia cambagei* (gidgee), with fallen elements of debris. These areas provide high quality nesting opportunities and refuge from predators for a number of small terrestrial mammals recorded in the locality including *Pseudomys desertor* (desert mouse) *Rattus villosissimus* (long-haired rat) *Notomys alexis* (spinifex hopping mouse) and *Sminthopsis macroura* (stripe-faced dunnart) (**Appendix E**).

No habitat containing cracking clay was observed within the Access Road corridor. This habitat types and associated Mitchell grass downs are known to be essential habitat components for the persistence of the *Sminthopsis douglasi* (Julia creek dunnart). The nearest record of this species in relation to the Investigation Area occurs approximately 150 km to the north east. It should be noted that cracking clay habitats may exist in the locality; however the only areas recorded during recent surveys existed to the north-east of Mount Elliot 5 ML.

Other common small terrestrial species, such as *Zyzomys argurus* (common rock rat) prefer habitats that were not recorded along the Access Road alignment. These habitats align with higher rocky escarpments and associated higher slope rocky drainage lines containing dense mature *Troidia* spp. (spinifex). It is considered unlikely that the Access Road will significantly impact of populations of this species in the locality.

Microchiropteran Bats

Microchiropteran bats are likely to forage throughout a range of habitat types along the Access Road alignment. Despite this, highest quality forage habitat exists alongside vegetated riparian channels containing mature canopy *Eucalyptus camaldulensis* (river red gum) and lower drainage lines with dense shrub layers of *Acacia chilsomii* (Chisholm's Wattle) and *Acacia cambagei* (gidgee). Furthermore, older growth vegetation associated with riparian channels has the potential to provide roosting hollows for a number of bat species known to exist in the locality, such as *Chalinolobus gouldii* Gould's wattled bat *Chalinolobus nigrogriseus* (hoary wattled bat), *Scotorepens balstoni* (inland broad-nosed bat), *Scotorepens greyii* (little broad-nosed bat), and *Saccolaimus flaviventris* (yellow-bellied sheath-tail bat).

There are a number of microchiropteran bat species known to exist in the locality that utilise caves, crevices and old structures (e.g. mining tunnels, buildings etc). These species include *Taphozous georgianus* (common sheath-tail bat), *Taphozous troughtoni* (Troughton's sheath-tail bat), and *Vespadelus finlaysoni* (inland cave bat). Although there is a diverse array of high quality habitats for these species in the Investigation Area, there were no suitable roosting habitats throughout the Access Road alignment, as it does not bisect and rocky escarpments. Owing to the home-ranges and roosting preferences in

crevices, caves and hollow trees of microchiropteran bats, it is considered unlikely that the Access Road will have a significant impact on critical habitat of these species.

1.5.4 Exotic and Declared Species

It is likely that a range of exotic species utilise habitat associated with the Access Road alignment. Open plain areas containing relatively sparse groundcovers, and consistent with local cattle stations, would be frequented by large grazing species including *Equus ferus caballus* (horse), *Bos taurus* (cow), *Sus scrofa* (feral pig), and *Camelus dromedarius* (camel). It must be noted that due to local cattle stations over the Investigation Area, these species are likely to frequent the Access Road, and appropriate management plans should be implemented to avoid vehicular strike.

Other smaller exotic mammal species are likely to utilise all habitat types associated with the Access Road alignment for movement, foraging and shelter. These species have been recorded during the recent survey and/or past surveys in the locality, and include *Rattus rattus* (black rat), *Mus musculus* (house mouse), *Felis catus* (feral cat), *Canis familiaris* (dingo) *Oryctolagus cuniculus* (rabbit), and *Vulpes vulpes* (fox).

1.5.5 Summary of Effects

Overall the proposed construction of the Access Road along this identified alignment would not impact upon any critical habitat for significant fauna species. The removal of extremely common habitats within the locality will not significantly reduce habitat in the locality. Despite this, the major impact areas of potential impact arising from the Access Road can be attributed riparian crossings. Whilst these areas are important for landscape connectivity, the construction of the alignment is highly unlikely to affect connectivity. Impacts are likely to occur from the removal of hollow bearing trees, or the secondary loss of pools stemming from scour around crossing points.

Figure 4 illustrates the locality of such crossings. Given there will be a severance of drainage line due to the Access Road, impacts will be extremely isolated however potentially impact on the hydrology and function of the waterways. Notwithstanding, measures should be taken to locate crossing points in locations where they would be likely to cause least direct and indirect impacts and to minimise loss of individual trees in these areas as they would benefit fauna by providing potential for older growth vegetation for fauna nesting and foraging, and corridor connectivity. Owing to the canopy tree density it should be possible to develop the alignment to avoid trees.

The increased amount of fast moving vehicles (in particular haul trucks) heightens the likelihood of fauna strike. This is likely to impact upon large macropods and reptilian species. As a consequence there is further risk of vehicular strike to raptor and bird species scavenging on such carrion.

1.5.6 Recommendations

Given the lack of high quality habitat noted along the Access Road there is a low risk of impacting on threatened fauna. It is recommended that the following management processes be contemplated:

- Minimising drainage line road crossing widths to avoid the unnecessary loss of remnant vegetation. All vegetation should be inspected to assess the potential for fauna species to be residing within the mature vegetation.
- Piping of significant drainage line crossings. This would allow the fluent movement of flood water and terrestrial fauna species reliant on riparian areas for movement corridors.
- For areas where vehicles operate (such as the Access Road and active mining leases) any fauna carcasses should be removed from access roads to a minimum of 20 metres from the road verge. This will avoid further fauna strike on scavenging species including raptors.

2.0 DECLINE AREA

2.1 Locality Description

The Decline Area is situated within the southern half of the Mt Dore 1 Mining Lease Area (**Figure 6**) and comprises approximately 10 ha designated for the construction of a Decline Shaft, Waste Rock Dump, Sediment Dams, Drying Pads, Laydown Areas and associated infrastructure.

2.2 Attributes

The Queensland Geological Mapping Data (July 2008) indicates that two geologies occur on the site – undifferentiated alluvium/colluvium (Land Zone 5 after Sattler and Williams 1999) in the southwest portion and metamorphic rocks of the Kuridala Formation (Land Zone 11, *ibid*) in the rest of the site.

From the ridge line that defines the eastern boundary of the site, the land falls steeply (approximately 25 degrees slope) to rolling foothills in the northwest and plains in the southwest. Several drainage lines transect the site from east to west.

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation community over most of the Access Road. The shrub layer is dominated by species of the genera *Acacia* and *Senna*. The seasonally depauperate ground layer is predominantly dominated by *Triodia molesta* (pincushion spinifex). This can be separated into two REs based on geology; thus RE1.5.3 is found on colluvium and red soils and RE1.11.2e is present on metamorphic geologies.

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation association over most of the area. On the rocky upper slopes of the eastern fringe *Acacia cambagei* (gidgee) becomes the dominant species. A shrub layer of topography-dependent density is dominated by species of the genera *Acacia* and *Senna*. This strata varies from extremely sparse in the south-west plains, to sparse in the foothills and medium within the drainage lines. The seasonally depauperate ground layer is dominated by *Triodia molesta* (pincushion spinifex); apart from the western gibber plains which are dominated by indigenous species of *Poaceae*.

A number of incised drainage lines of 5-10m width and <2m depth cross the area in a generally east to west direction. These do not typically have their own functioning riparian community and instead floristics are comprised of species found in the broader surrounding RE types.

2.3 Sampling Approach

2.3.1 Flora

The objectives of this survey were to:

1. Provide a full inventory of flora species;
2. Determine the presence of threatened and/or locally significant species; and,
3. Align the site's vegetation communities to prescribed regional ecosystems.

A detailed foot traverse throughout the site was performed on 16th September 2010 by two PDG botanical and ecological personnel. The site was qualified using secondary site survey methodology (Neldner 2004) and vegetation communities were assessed as per the methodologies of Walter and Hopkins (1984).

The species-specific survey methodology utilised for this site was a "walk-through, total species" account. The structural composition of the site was assessed using "Sheet C:

Vegetation structure –crown cover estimated, (as per “Request for Assessment of Regional Ecosystem Map, Version 5.0 (2006)”, Queensland Herbarium, EPA, Brisbane.

Species percentage was not recorded, however the dominant species from each emergent, understorey and groundcover layer were noted.

2.3.2 Fauna

An intense fauna survey over 3 days and 3 nights encompassing a broad range of direct and indirect sampling techniques was conducted. Full details of all methodologies and techniques used have been provided within **Appendix G**.

2.4 Vegetation and Regional Ecosystems

2.4.1 Species

A total of 60 flora species were recorded across the Decline Area (**Appendix F**). No introduced species were recorded.

2.4.2 Threatened Flora Species

With reference to Queensland’s NC Act and the Commonwealth’s EPBC Act, no flora species or communities of conservation significance were recorded within the Decline Area.

2.4.3 Regional Ecosystems

Two analogous regional ecosystems are present on the site; RE 1.5.3 on colluviums, skeletal soils and red earths; and RE 1.11.2, with major vegetation communities described by Queensland Herbarium (2009); RE1.11.2x2 and 1.11.2a being present. The REs are represented spatially as **Figure 6**.

Both analogous REs are structurally intact with minimal disturbance, save for mining exploration tracks and can be considered to be remnant vegetation as described by the VM Act.

Both REs carry a vegetation management status of *Least Concern and a Biodiversity status of No Concern at Present* which are the lowest conservation significance levels (greater than 30% of the pre-settlement RE remains).

None of these are considered threatened ecological communities at a national level under the EPBC Act.

2.4.3.1 Regional Ecosystem 1.5.3 – *Eucalyptus leucophloia* (snappy gum) low open-woodland

Description

This community occupies the majority of the lower slope colluvial and skeletal red earth areas. The canopy layer (2.5-6m) is sparse to very sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Corymbia terminalis* (western bloodwood) and *Eucalyptus normantonensis* (Normanton box). The primary shrub layer (1-2.5m) is sparse to very sparse and is dominated by *Acacia chisholmii* (Chisholm’s wattle) with associated *Senna artemisioides* subsp. *oligophylla* (limestone cassia) and *Senna glutinosa* subsp. *pruinosa* (silver cassia). Other species present include *Acacia acradenia*, *Atalaya hemiglauca* (whitewood) and *Grevillea striata* (beefwood). The secondary shrub layer (0.5-1m) is very sparse and is dominated by *Acacia chippendalei* (Chippendale’s wattle) with associated *Senna notabilis* (cockroach bush). The ground layer (0-0.5m) is dense

and is dominated by *Triodia molesta* (pincushion spinifex) with associated *Pterocaulon serrulatum* (apple bush).

Treeless areas are occasionally present within this broader RE type; the largest contiguous area of which manifests as gibber plain in the western portion of the site. The canopy layer is non-existent, and the shrub layer (0.5-2m) is of a medium density and dominated by *Senna artemisioides* subsp. *oligophylla* (limestone cassia) with associated *Senna glutinosa* subsp. *pruinosa* (silver cassia) and *Acacia chisholmii* (Chisholm's wattle). The ground layer (0-0.5m) is dense and is dominated by *Aristida contorta* (bunched kerosene grass) with associated *Enneapogon oblongus* (purple head nineawn) and *Sporobolus australasicus* (Australian dropseed).

Incised drainage lines present do not typically have their own functioning riparian community and floristically are comprised of species found in the broader surrounding RE type.

See (**Appendix F**) for the full species account.

Species of Conservation Significance

With reference to the NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this vegetation community. Suitable habitat exists for a number of threatened species known to occur in the area, and while the trees and shrubs are easily detectable year-round, certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs are not readily detectable during the dry season. It is therefore recommended that post-wet season surveys are undertaken to assess the presence or absence of these species in this vegetation community.

Weeds

No declared weed species were recorded.

Status

RE1.5.3 has a management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.5.3 occurs on undulating plateau surfaces; lateritic red earths, and small areas of shallow sandy loams and skeletal soils.

A number of drainage lines are present within this RE type. Whilst floristic diversity is much simplified when compared to that of the surrounding (broader RE) no major communities are recognised by the Queensland herbarium (2009) for this RE type.

Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. The natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every year, but also ensuring some patches are long unburnt. Annual burnt areas should be less than 30%.

2.4.3.2

Regional Ecosystem 1.11.2 – *Eucalyptus leucophloia* (snappy gum) low woodland to low open-woodland

Description

Eucalyptus leucophloia (snappy gum) low open-woodland or low woodland, sometimes with *Eucalyptus leucophylla* (Cloncurry box) usually with a *Acacia* spp. (wattles) dominated shrub layer and *Triodia* spp. (Spinifex grass) and/or tussock grass understorey. Treeless areas common. RE1.11.2 occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths (**Figure 6**). The two major vegetation communities include:

1.11.2a: Low open-woodland of *Eucalyptus leucophloia* (snappy gum) often with *Corymbia* spp. (bloodwood), *Terminalia aridicola* (arid peach) and *Eucalyptus leucophylla* (Cloncurry box) with shrub layer of *Acacia* spp. (wattle) and ground layer of *Triodia* spp. (Spinifex grass); occurs on steep hills and strike ridges.

This community occupies the lower slopes and north-western portion of the site. The canopy layer (2.5-6m) is sparse to very sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Corymbia terminalis* (western bloodwood) and *Eucalyptus normantonensis* (Normanton box). Other species present include *Alphitonia excelsa* (soapwood) and *Atalaya hemiglauc*a (whitewood). The shrub layer (0.5-2.5m) is sparse to extra sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle). Associated species include *Senna artemisioides* subsp. *oligophylla* (limestone cassia), *Senna glutinosa* subsp. *pruinosa* (silver cassia), *Eremophila maculata* (spotted fuchsia bush) and *Eremophila longifolia* (berrigan). The ground layer (0-0.5m) is dense and is dominated by *Triodia molesta* (pincushion spinifex) with associated *Acacia chippendalei* (Chippendale's wattle), *Senna notabilis* (cockroach bush) and *Pterocaulon serrulatum* (apple bush).

Community 1.11.2x2 – *Acacia cambagei* (gidgee) low woodland to low open woodland

This community occurs on the rocky upper slopes of the site. The canopy layer (2-6m) is sparse to very sparse and is dominated by *Acacia cambagei* (gidgee) with associated *Eucalyptus leucophloia* (snappy gum) and *Eucalyptus normantonensis* (Normanton box). The shrub layer (0.5-2m) is extremely sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle). The ground layer (0-0.5m) is of a sparse to medium density and is dominated by *Triodia molesta* (pincushion spinifex).

Incised drainage lines present do not typically have their own functioning riparian community and floristically are comprised of species found in the broader surrounding RE type.

See (**Appendix F**) for the full species account.

Species of Conservation Significance

With reference to the NC Act and the Commonwealth's EPBC Act, no species of conservation significance were recorded from this vegetation community. Suitable habitat exists for a number of threatened species known to occur in the area, and while the trees and shrubs are easily detectable year-round, certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs are not readily detectable during the dry season. It is therefore recommended that post-wet season surveys are undertaken to assess the presence or absence of these species in this vegetation community.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.11.2, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

RE1.11.2 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

RE1.11.2x2 burns between the onset of the wet and the dry and requires fire for recruitment. However burning intervals needs to be long, typically greater than 30 years to maintain health.

2.4.4 Summary of Effects

No environmental constraints were identified within the Decline Area. It is considered that no flora species, communities or ecosystems listed as significant under the NC Act, VM Act or EPBC Act will be adversely affected by the proposed development.

2.4.5 Recommendations

It is recommended that a weed management procedure be implemented for the operational phase of the development, to prevent the introduction of weed species as a result of increased traffic and the proliferation of weeds due to increased disturbance.

2.5 Fauna and Habitats

2.5.1 Habitats of the Alignment

PDG conducted a detailed habitat assessment and complete fauna survey of the Mt Dore 1 ML. This study intended to investigate the potential for any threatened species to persist within the site as well as assess the usage of specific habitat types and the relative values attributed to such habitat types. This ML is to be actively mined post these survey efforts. These surveys utilised a three day three night intensive survey effort with trapping, spotlighting, census surveys and active searching for fauna within the site. Habitat analysis throughout the site involved both vehicular and foot traverses by two ecologists to inspect all habitat types across the ML. Aerial photography was also used to aid this assessment to allow an informed interpretation of habitats that are inaccessible by vehicle and foot.

The western portions of the Mount Dore 1 ML are dominated by a main range running north-south. These areas contain higher rocky escarpments and associated steep foothills and extensive undulating plains. The higher rocky escarpments are sparsely vegetated with a ground cover of *Triodia molesta* (pincushion spinifex) and a canopy consisting of *Eucalyptus leucophloia* (snappy gum). There are a number of rock piles and crevices present throughout these areas, in particular the higher ridgelines. The presence of these habitat features correlates with the capture of a number of smaller terrestrial mammals (e.g. common rock-rat) during the current

survey effort. Despite this, the rocky ridgelines within the Mount Dore 1 ML do not contain any larger crevices and deep caves such as those found in other ranges in the region. Due to this there was a notably reduced number of larger terrestrial fauna (e.g. macropods) recorded in these areas.

There were a number of eroded gully areas present within the steeper foothills. These areas primarily contained large rocky incise banks that provide high quality habitat for small terrestrial fauna. Similar to the higher rocky ridges, there were a number of small mammals captured in these areas.

The lower slopes and foothills through the central portions of the ML provide a mixture of high to moderate quality habitat types which include the aforementioned rocky slopes and gullies to densely vegetated undulating hills. Higher quality habitat throughout these areas is abundant due to variations in topographical features and associated floristic composition. The larger *Triodia molesta* (pincushion spinifex) clumps with dense *Acacia chisholmii* (Chisholm's wattle) and *Acacia cambagei* (gidgee) stands on sloping foothills provide high quality habitat for small terrestrial and passerine species.

There are a small number of isolated knolls which occur in the northern and central portions of the ML. These knolls contain rocky outcrops associated with their peaks. These areas provide similar habitat features to those found in the higher escarpments, however are unlikely to support a high density of smaller terrestrial fauna given the lack of connectivity with higher quality habitat. There are a number of vehicular access tracks that have been previously cut across the ML from the west to east, only one of which crosses the range and is located in the north of the ML.

The lower alluvial flats and plains within the western portions of the ML provide little habitat structure, with numerous cleared patches of red soil and very little canopy cover. These areas are primarily dominated by *Aristida contorta* (bunched kerosene grass) and occasional *Triodia molesta* (pincushion spinifex) clumps on stony soils.

2.5.2 Sampling Effort

An intense fauna survey over 3 days and 3 nights was conducted. Full details of all methodologies and techniques used have been provided within **Appendix G. Figure 7** demonstrates the location of the trapping lines deployed within the Decline Area of Mt Dore 1.

TABLE 2: FAUNA HABITAT TYPES OF THE DECLINE AREA

Habitat Type	Habitat Reference	Description	Habitat Quality*
Rocky Escarpments	1	Higher rocky ridge lines containing small to large rock piles and crevices. Areas comprise sparse <i>Triodia molesta</i> (pincushion spinifex) groundcover on rocky surfaces with very sporadic canopy of <i>Eucalyptus leucophloia</i> (snappy gum) and occasional stand of <i>Acacia cambagei</i> (gidgee).	High
Higher slope gullies	3	Eroded gullies within the steeper foothills containing rocky incised banks and crevices. Primarily contain large rocky incised banks with a moderately dense cover of <i>Triodia molesta</i> (pincushion spinifex) and/or <i>Acacia chisholmii</i> (Chisholm's wattle). Occasional <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood) trees present; however for the most part taller canopy trees are usually absent.	Moderate - High
Sloping Foothills	4	Steep foothills containing a sparse canopy of <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood). Generally comprised of a denser groundcover dominated by medium sized <i>Triodia molesta</i> (pincushion spinifex). Areas can be dominated by dense clumps of <i>Acacia chisholmii</i> (Chisholm's wattle) and/or <i>Acacia cambagei</i> (gidgee) with a sparse groundcover.	Moderate
Rocky knolls	5	Small knolls of exposed rocky outcrops supporting small crevices similar to rocky escarpments. Generally exposed metamorphic rock surrounded by moderately sloping foot hills with a sparse <i>Triodia molesta</i> (pincushion spinifex) ground cover and a sporadic to sparse <i>Eucalyptus leucophloia</i> (snappy gum) and/or <i>Acacia chisholmii</i> (Chisholm's wattle) canopy.	Moderate
Undulating plains	6	Dominated by slightly undulating hills containing moderately dense ground covers of small to medium <i>Triodia molesta</i> (pincushion spinifex) clumps on rocky surfaces. Occasional areas dominated by stands of <i>Acacia chilsomii</i> (Chisholm's Wattle). Canopy is predominately sparse comprising <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood).	Moderate - Low
Flat plains	7	The lower stony flats and plains provide little habitat structure, with numerous cleared patches of red soil and very little canopy cover. These areas are primarily dominated by <i>Aristida contorta</i> (bunched kerosene grass) and sparse <i>Triodia molesta</i> (pincushion spinifex) clumps on very stony soils. Very little to no canopy vegetation present.	Low
Lower alluvial drainage lines	9	Dominated by medium to large <i>Triodia molesta</i> (pincushion spinifex) clumps with occasional stands of dense <i>Acacia chilsomii</i> (Chisholm's Wattle) or <i>Eucalyptus normantonensis</i> (Normanton box). Contains sparse canopy species in areas comprising of <i>Eucalyptus leucophloia</i> (snappy gum) and <i>Corymbia terminalis</i> (western bloodwood). Soils vary from areas of fine sands to areas containing small stones and pebbles (colluvial).	Moderate - high

Notes:

*: refer to Table 6 – Habitat Quality Assessment for details of rating criteria

2.5.3 Site Survey Data and Threatened Species Analysis

2.5.3.1 Amphibians

Survey efforts recorded no amphibians within the Decline Area (**Appendix G**). The highest quality habitat for amphibians present within the Decline Area exists in the lower alluvial drainage lines. These habitats contain moderately dense clumps of *Triodia molesta* (pincushion spinifex) and occasional areas containing stands of dense *Acacia chilsomii* (Chisholm's Wattle) and *Acacia cambagei* (gidgee). Furthermore, there is the potential for these habitats to retain water following heavy rain, and as a result may provide suitable breeding and forage habitat for species that exist in the locality. These species include *Litoria caerulea* (green tree frog), *Litoria rubella* (desert tree frog) *Cyclorana australis* (water holding frog). Softer sands provide potential burrowing habitat for other species known to exist in the locality, including *Opisthodon ornatus* (ornate burrowing frog).

Overall, habitat quality for amphibians within the Decline Area is relatively low. It is considered unlikely that any disturbance will significantly impact of populations in the locality. It should be noted that recent surveys were conducted during rain periods and very cold weather conditions (**Appendix H**). The timing of the surveys was not ideal for detecting amphibians.

2.5.3.2 Reptiles

Survey effort recorded three reptile species within the Decline Area during active diurnal searches. These species included the *Ctenophorus isolepis* (central military dragon), *Diporiphora winneckeii* (canegrass two-lined dragon), and *Pseudonaja nuchalis* (western brown snake) (**Appendix E**). The *Pseudonaja nuchalis* (western brown snake) was found deceased on a vehicle access road with wounds typical of those created by a raptor. Although this species may have been dropped into the Decline Area, it is still considered likely to occur.

There are no suitable freshwater habitats present within the Decline Area to support freshwater turtles, or species reliant on freshwater resources.

The majority of the Decline Area provides moderate to high quality forage and shelter habitat for reptile species within the locality. These include undulating plains with varying densities of *Triodia molesta* (pincushion spinifex), rocky escarpments to steep foothills containing crevices, and incised drainage lines with low-lying vegetation with fallen timber and debris.

It is envisaged that a greater diversity of reptile species persist within the Decline Area than those identified during recent surveys, such as those recorded in previous surveys and database searches (**Appendix E**). The listed *Acanthopis antarcticus* (common death adder) was not recorded during recent surveys; however it is considered likely to utilise habitat in rocky escarpments or steep foothills within the Decline Area. It should be noted that this species has previously been encountered in the mining camp area less than 2 km away.

2.5.3.3 Birds

The Decline Area supports a number of habitat types suitable for a diverse suite of avifauna species. Recent diurnal and nocturnal survey recorded forty-two avifauna species within the Decline Area (**Appendix I**).

Migratory birds

Recent surveys recorded one migratory bird species utilising habitat within the Decline Area. The *Merops ornatus* (rainbow bee-eater) was observed frequently foraging throughout the steeper foothills on the eastern portions of the Decline Area. It is also

considered likely that the *Apus pacificus* (fork-tailed swift) would forage over the Decline Area, however this species often flies at high altitudes, and is difficult to observe.

The Decline Area contains no suitable waterway or riparian habitat for migratory wetland species that are confirmed or potentially occur in the locality. These species include the *Ardea ibis* (cattle egret), *Egretta alba* (great egret), *Glareola maldivarum* (oriental pranticole), *Haliastur leucogaster* (white-bellied sea-eagle), *Charadrius veredus* (oriental plover), *Rostratula benghalensis* (painted snipe), and *Rostratula australis* (Australian painted snipe). The *Rostratula australis* (Australian painted snipe) is listed as vulnerable under the EPBC Act and NC Act. It is highly unlikely that the Decline Area would form a critical habitat component to these species, due to the availability of nearby riparian wetland areas associated with the Mort River and dams.

Owing to the lack of preferred dense lowland vegetation and termite mounds of suitable breeding habitat it is considered highly unlikely that the terrestrial migratory *Pezoporus occidentalis* (night parrot) would exist within the Decline Area. This species has not been recorded in the locality and is only known from a scarcity of confirmed records (approx 200 km south-east).

Passerine Birds

Steep foothills containing mature *Triodia molesta* (pincushion spinifex) and incised drainage channels dominated by dense stands *Acacia chilsomii* (Chisholm's Wattle) were regularly utilised for foraging and shelter by a range of smaller passerine bird species. These species include the *Artamus minor* (little woodswallow), *Artamus cyanopterus* (dusky woodswallow), *Taeniopygia guttata* (Zebra Finch), *Malurus lamberti* (Variegated Fairy-wren), and *Eremiornis carteri* (spinifexbird). The cryptic *Amytornis purnelli ballarae* (kalkadoon grasswren) was recorded on a number of occasions foraging amongst larger *Triodia molesta* (pincushion spinifex) clumps on the steeper foothills of the Decline Area. This species is often difficult to observe and has a distribution that is limited to the Selwyn Ranges. Due to availability of suitable habitat throughout the locality, it is unlikely that the isolated disturbances of the Decline Area will impact significantly on populations of smaller passerine bird species.

There were a number of larger bird species that were recorded frequently utilising all habitats throughout the Decline Area. These were typically the more common species, including the *Cracticus tibicen* (Australian magpie), *Cracticus nigrogularis* (pied butcherbird), *Cracticus torquatus* (grey butcherbird), *Cacatua sanguinea* (little corella), *Eolophus roseicapilla* (galah), *Coracina novaehollandiae* (black-faced cuckoo-shrike), *Geopelia cuneata* (diamond dove), *Geopelia striata* (peaceful dove), *Geophaps plumifera* (spinifex pigeon), *Ocyphaps lophotes* (crested pigeon), *Phaps chalcoptera* (common bronzewing pigeon), *Corvus coronoides* (Australian raven), *Corvus orru* (Torresian crow). Owing to the nomadic nature and high abundance of these species, it is considered highly unlikely that disturbance within the Decline Area would significantly impact on populations throughout the locality.

The Decline Area contains suitable habitat for the listed *Heteromunia pectoralis* (pectorella manikin). These include scattered canopy trees and groundcovers of *Triodia molesta* (pincushion spinifex) and other grasses. Although this species requires daily water, it will travel great distances to do so. It is unlikely that the Decline Area disturbance would result in the loss of critical habitat for this species, however the *Heteromunia pectoralis* (pectorella manikin) is likely to utilise the Decline Area on occasions.

Diurnal Raptors

Diurnal raptors were frequently documented during diurnal surveys foraging over higher rocky peaks and foothills throughout the eastern portions of the Decline Area. Species of diurnal raptors that occurred in the Decline Area included the *Aquila audax* (wedge-

tailed eagle), *Milvus migrans* (black kite), *Falco berigora* (brown falcon), *Falco peregrinus* (peregrine falcon), *Falco longipennis* (Australian hobby), and listed *Falco hypoleucos* (grey falcon) and *Lophoictinia isura* (square-tailed kite). Diurnal raptor species have extensive home ranges encompassing a matrix of foraging, roosting and breeding habitats. The Decline Area provides good forage habitat for diurnal raptors, however there is little of the preferred nesting habitat for diurnal raptors. These areas consist of large trees lining dams, riparian channels and incised drainage lines, and steep foothills. It should be noted that no raptor nests were observed throughout the Decline Area.

It is expected that a greater number of diurnal raptor species other than those recorded during recent surveys would forage over the Decline Area. These species include *Hamirostra melanosternon* (black-breasted buzzard) *Elanus scriptus* (letter-winged kite), *Elanus axillaris* (black shouldered kite), *Circus approximans* (swamp harrier), *Circus assimilis* (spotted harrier), *Hieraetus morphnoides* (little eagle), *Accipiter fasciatus* (brown goshawk), *Accipiter novaehollandiae* (grey goshawk), *Accipiter cirrocephalus* (collared sparrowhawk), *Falco cenchroides* (nankeen kestrel), and *Haliastur sphenurus* (whistling kite). Owing to the vast amount of quality forage habitat throughout the locality, it is considered unlikely that the Decline Area disturbance would have a significant impact of populations of diurnal raptors.

Nocturnal Birds

The *Eurostopodus argus* (spotted nightjar) was the only nocturnal bird species recorded within the Decline Area during recent surveys (**Appendix I**). This species was encountered on numerous occasions during each night and is likely to occur abundantly throughout the extent of the Investigation Area.

The Decline Area contains no suitable waterway or riparian habitat preferred by the *Nycticorax caledonicus* (nankeen night-heron). It is considered unlikely that this species would utilise the Decline Area due to the presence of nearby freshwater habitats within the Mort River corridor and dam areas.

Owing to the abundance of prey species (small terrestrial mammals and passerine birds) in rocky foothills and incised drainage lines, the Decline Area is likely to form part of the large foraging ranges of a number of nocturnal raptor species. These include *Ninox connivens* (Barking Owl), *Ninox novaeseelandiae* (southern boobook), *Tyto alba* (barn owl), *Aegotheles cristatus* Australian owl-nightjar and *Podargus strigoides* (tawny frogmouth). Sparse canopy vegetation of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) throughout the Decline Area does not provide suitable nesting hollows for nocturnal raptors. Although the Decline Area provides potential forage habitats, it is considered unlikely that these areas would form critical habitat components for nocturnal raptors due to the vast amount of high quality habitat in larger riparian areas and rocky escarpments throughout the locality.

2.5.3.4

Mammals

Large common terrestrial mammal species were recorded frequently utilising the majority of the Decline Area. These include *Macropus rufus* (red kangaroos), *Macropus giganteus* (eastern grey kangaroo) and *Macropus robustus* (common wallaroo). These areas include flat to slightly undulating plains and steep foothills dominated by either *Triodia molesta* (pincushion spinifex) or *Aristida contorta* (bunched kerosene grass) with a sparse canopy cover of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). The relatively high abundance and nomadic nature of these species', means that the Decline Area disturbance would have little impact on populations within the locality.

It should be noted that an increase in vehicular strike on larger terrestrial mammals does pose a threat to individuals. Fauna management should be implemented to avoid vehicular strikes and if required remove carcasses from the access roads throughout the Decline Area.

The Decline Area does not contain any high rocky outcrop habitats preferred by the *Petrogale purpureicollis* (purple-necked rock-wallaby). This species requires a range of larger rock piles and caves as refuge from its main predators *Aquila audax* (wedge-tailed eagle). There are a number of high quality habitats containing suitable features in the locality, including large disturbed rock dumps created by previous mining overburden. It is considered highly unlikely that the Decline Area provides any critical habitat of the *Petrogale purpureicollis* (purple-necked rock-wallaby).

The *Zygomys argurus* (common rock-rat) was well represented in during recent trapping surveys. The highest quality habitat for this species was associated with rocky ridges, associated foothills and incised drainage lines. These habitat types provide numerous rock piles and crevices, as well as dense understorey layers of mature *Triodia molesta* (pincushion spinifex) clumps, areas of dense *Acacia chilsomii* (Chisholm's Wattle) and *Acacia cambagei* (gidgee), with fallen elements of debris. It was noted that rock piles created by road clearance and mine preparation has created an increase in quality shelter habitat for the *Zygomys argurus* (common rock-rat). It is likely that these areas also provide nesting opportunities and refuge from predators for a number of additional small terrestrial mammals known to exist in the locality (**Appendix E**). Owing to the availability of suitable habitat throughout the locality and the positioning of the Decline Area disturbance outside of these areas, it is considered unlikely to impact on populations of small terrestrial mammals. Conversely, disturbance creating larger rock piles may enhance nesting habitat for species such as the *Zygomys argurus* (common rock-rat).

The Decline Area does not contain cracking clay and Mitchell grass downs habitat critical for the persistence of the *Sminthopsis douglasi* (Julia Creek dunnart). It is highly unlikely that this species exists in habitats throughout the Decline Area or surrounds.

Microchiropteran Bats

The recent survey using ANABAT echolocation methods and expert identification recorded five species foraging throughout the Decline Area (**Appendix K** for expert identification report by Glenn Hoye). These included *Chaerophon jobensis* (northern free-tail bat), *Vespadelus finlaysoni* (Finlayson's cave bat), *Nyctophilus sp.* (unidentified long-eared Bat), *Saccolaimus flaviventris* (yellow-bellied sheathtail bat), and the *endangered Taphozous troughtoni* (Troughton's sheathtail bat). The Decline Area provides little of the required cave and/or hollow roosting habitat for microchiropteran bats. It is expected that a greater number of microchiropteran bats species other than those recorded during recent surveys would forage over the Decline Area. Additionally, it is likely that future disturbance within the Decline Area would increase forage resources (e.g. invertebrates) for insectivorous microchiropteran bat species.

The listed *Macroderma gigas* (ghost bat) was not detected during any surveys efforts within the Decline Area. This species is dependent on rocky outcrops containing deep caves for roosting habitat. Such habitat features were not present in rocky ridges within the Decline Area. This species may potentially utilise the site and surrounding locality for foraging purposes as a part of a broader home range, however it has been recognised that this species has undergone a contraction in its range and is now mostly restricted to tropical north Australia. Old mine shafts and large caves which exist throughout the locality may potentially provide suitable habitat for the *Macroderma gigas* (ghost bat).

2.5.4 Exotic and Declared Species

Two exotic fauna species were recorded within the Decline Area during recent surveys. These species include the *Mus musculus* (house mouse) and *Felis catus* (feral cat). The *Mus musculus* (house mouse) was captured using trapping methods in flatter plains areas dominated by *Aristida contorta* (bunched kerosene grass) and occasional *Triodia molesta* (pincushion spinifex) clumps on very stony soils. The *Felis catus* (feral cat) was

recorded using infra-red camera techniques in lower drainage lines in central portions of the Decline Area.

The majority of the Decline Area is dominated by flat to slightly undulating plains with sparse *Triodia molesta* (pincushion spinifex) clumps or *Aristida contorta* (bunched kerosene grass) with a sparse canopy cover of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). Owing to this, it is likely that a number of exotic species, particularly those consistent with local cattle stations would utilise the Decline Area frequently. These species include *Equus ferus caballus* (horse), *Bos taurus* (cow), *Sus scrofa* (feral pig), *Camelus dromedarius* (camel), *Rattus rattus* (black rat), *Mus musculus* (house mouse), *Felis catus* (feral cat), *Canis familiaris* (dingo), *Oryctolagus cuniculus* (rabbit), and *Vulpes vulpes* (fox).

2.5.5 Summary of Effects

The proposed disturbance area for the mining activities is a small percentage of the overall Mt Dore 1 ML. This disturbance however involves a number of road ways and infrastructure. Overall the proposed construction of the infrastructure, road ways, decline pit and waste dump area will not significantly reduce the ML's higher quality habitat areas. A concise impact within the central foothills of the ML will reduce the foraging habitat for fauna utilising this site, however no threatened species will significantly impacted upon by the proposed mining activities.

Fauna utilising the lower slope gully lines and undulating plains will be displaced from these immediate habitats, however these habitats remain common within the ML and greater Investigation Area and it is not thought that this will significantly impact upon faunal assemblages.

The increased amount of vehicles movements (in particular haul trucks) heightens the likelihood of fauna strike. This is likely to impact upon large macropods and reptilian species. As a consequence there is further risk of vehicular strike to raptor and bird species scavenging on such carrion.

2.5.6 Recommendations

The impact areas of the Mt Dore ML does not support habitat critical to any noted threatened species, however the retention of vegetation and gullies areas in a natural state would benefit faunal communities utilising the disturbance areas post commencement of mining. It is recommended that the following management processes be contemplated:

- Retention of all mature trees outside of the immediate impact areas within the ML;
- Retention of rocky gully areas where practicable to retain marginal habitat for species such as the *Zyomys argurus* (common rock rat) and other cryptic fauna;
- Rehabilitation of impact areas with native endemic vegetation;
- Piping of significant drainage line crossings. This would allow the fluent movement of flood water and terrestrial fauna species reliant on riparian areas for movement corridors.
- For areas where vehicles operate (such as the Access Road and active mining leases) any fauna carcasses should be removed from access roads to a minimum of 20 metres from the road verge. This will avoid further fauna strike on scavenging species including raptors.

3.0 MINING LEASE AREAS

3.1 Sampling Approach

3.1.1 Flora

The objective of the survey was to align the vegetation communities present within each ML Group to prescribed regional ecosystems. The survey methodology employed consisted of:

- Ground-truthing vegetation community interpretation based on aerial photography and geology mapping; and
- Meander transects (by vehicle and on foot) through representative vegetation communities.

Vehicular and foot traverses throughout the Investigation Area were performed from the 17th to the 22nd September 2010 (inclusive) by two PDG botanical and ecological personnel. Each ML was qualified using secondary site survey methodology (Neldner 2004) and vegetation communities were assessed as per the methodologies of Walter and Hopkins (1984).

Species percentage was not recorded; however the dominant species from each emergent, understorey and groundcover layer for each vegetation community were noted.

3.1.2 Fauna

Sampling efforts across the Investigation Area remained consistent through all MLs. This approach consisted of the following:

- Interpretation and Review of aerial photography for each mining lease areas to gain an understanding of the vegetation densities and potential habitats within the ML;
- Detailed foot and vehicular traverse of the site by two ecologists to investigate and define all potential habitat types within the ML;
- Investigation of microhabitat to search for evidence of fauna inhabiting specific habitat types (i.e. caves). This included spotlighting and scat collection; and
- Documentation of all species encountered or potentially utilising habitats within the ML.

3.2 Mount Elliott

The Mount Elliot Group comprises 5 separate Mining Lease Areas comprising a total area of 642 ha.

3.2.1 Vegetation and Regional Ecosystems

Eucalyptus leucophloia (snappy gum) is the dominant vegetation type over most of the site, with *Acacia cambagei* (gidgee) becoming common within this community in the south and the north. *Acacia shirleyi* (lancewood) woodland is prevalent on scattered ridgetops in the north of the group. A shrub layer of topography-dependent density is dominated by species of the genera *Acacia* and *Senna*. This stratum varies from extremely sparse in the south-west plains and scattered ridgetops, to sparse in the foothills and medium within the drainage lines. The seasonally depauperate ground layer is dominated by *Triodia molesta* (pincushion spinifex).

With reference to Queensland's NC Act and VM Act and the EPBC Act, no flora species or communities of conservation significance were recorded within the Mt Elliott Investigation Area.

Four analogous regional ecosystems (**Figure 8**) are present within the Mt Elliott Group. These include: RE1.3.7 on active alluvium within watercourses; RE1.3.5 on colluvium, skeletal soil and shallow red earths of lower slopes; RE1.10.4 on stony sandstone plateaux; and RE1.11.2 on hills and ranges of strongly folded metamorphics.

RE 1.3.7 - *Eucalyptus camaldulensis* (river red gum) woodland on channels and levees in south of bioregion.

Description

A small area of this RE exists in the south-west corner of Mt Elliott 1 (**Figure 8**). This community typically occurs on recent levees and channel deposits of larger tributaries, primarily on alluvial soils. A small area of this RE exists in the south-west corner of Mount Elliott 1 and the east of Mount Elliott 4.

Structure

The canopy layer (3-12m) is sparse to medium and dominated by *Eucalyptus camaldulensis* (river red gum). The shrub layer (0.5-2m) is extremely sparse to medium and is dominated primarily by *Acacia chisholmii* (Chisholm's wattle). The ground layer (0-0.5m) is very sparse to sparse and dominated by *Triodia molesta* (pincushion Spinifex) in the denser, stonier substrates and **Pennisetum ciliare* (buffel grass) in areas with more alluvial soil. Native Poaceae species such as *Aristida inequiglumis* (feather-top three-awn) also occasionally occur within this community.

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *Endangered*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.3.7 is considered *Endangered* under DERM's biodiversity assessment on account of regional degradation of this RE by high total grazing pressure (direct impacts associated with trampling, secondary impacts associated with exotic pasture species introductions principally **Pennisetum ciliare* (buffel grass) and tertiary impacts associated with altered fire regimes (arising from buffel grass which carries a greater biomass than undisturbed systems) and habitat alteration).

Natural examples of these systems do burn patchily due to low flammability and small fuel loads, however they should not be targeted for prescribed burning. This is particularly pertinent for waterways containing **Pennisetum ciliare* (buffel grass) which significantly contributes to the fuel load and exacerbates the vulnerability of these areas to fire.

Although these analogous REs fulfil criteria for remnant status, their extent within the landscape would generally make them too small to map at the scales utilised by DERM. Despite this they should be treated as functioning representations of RE1.3.7 and management considerations appropriate for them apply.

RE 1.5.3 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on red earths on plateaus.

Description

This RE occurs in the southern portion of the Mt Elliott Investigation Area, in MLs 1, 2 and 4 (**Figure 8**). This community typically occurs on undulating plateau surfaces and on hills and ranges on strongly folded metamorphic pre-Cambrian rocks, with lateritic red earths, small areas of shallow sandy loams and skeletal soils.

Structure

The canopy layer (2-8m) is sparse to very sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Eucalyptus normantonensis* (Normanton Box) and *Eucalyptus leucophylla* (Cloncurry box) within the drainage lines. The shrub layer (0.5-2m) is very sparse and is dominated by *Acacia melleodora* (no common name) with associated *Acacia tenuissima* (no common name). Other species present include *Senna artemisioides* subsp. *oligophylla* (limestone cassia) and *Acacia hilliana*. The ground layer (0-0.5m) is medium to dense and dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.5.3 occurs on undulating plateau surfaces; lateritic red earths, and small areas of shallow sandy loams and skeletal soils.

A number of drainage lines are present within this RE type. Whilst floristic diversity is much simplified when compared to that of the surrounding (broader RE) no major communities are recognised by the Queensland herbarium (2009) for this RE type.

Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every year, but also ensuring some patches are long unburnt. Annual burnt areas should be less than 30%.

RE 1.10.4 - *Eucalyptus leucophloia* (snappy gum) and/ or *Acacia* spp. low open woodland on stony sandstone plateaus

Description

Small areas of this RE occur on the western border and in the northern portion of Mt Elliott 5 (**Figure 8**). This community occurs on residual plateaus and scarps on or near horizontally bedded sandstones and conglomerates and skeletal soils.

Structure

The canopy layer (2-8m) is sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Eucalyptus normantonensis* (Normanton Box). The shrub layer (0.5-2m) is extremely sparse and is co-dominated by *Acacia orthocarpa* (no common name) and *Eremophila maculata* (spotted fuchsia bush) with associated *Acacia* sp. The ground layer (0-0.5m) is of a medium density and is dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

RE1.10.4 has a management status of *Least Concern* and a biodiversity status of *No Concern at Present*.

Notes

RE1.10.4 is a very sparse community occurring on stony sandstone plateaus with the structure occasionally being dominated by Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every year, but also ensuring some patches are long unburnt. Annual burnt areas should be less than 30%.

RE 1.11.2 - *Eucalyptus leucophloia* (snappy gum) low open woodland

Description

This RE is the dominant community within the Mt Elliott Investigation Area, occurring across the majority of each of the 5 MLs (**Figure 8**). It typically occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths.

Structure

The canopy layer (2-8m) is very sparse to sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Eucalyptus normantonensis* (Normanton Box) and *Corymbia terminalis* (western bloodwood).

The shrub layer (0.5-2m) is extremely sparse to sparse and is co-dominated by *Acacia orthocarpa* and *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia gonoclada* and *Senna artemisioides* subsp. *oligophylla* (limestone cassia).

The ground layer (0-0.5m) is medium to dense and dominated by *Triodia molesta* (pincushion spinifex).

One major vegetation recognised by the Queensland Herbarium (2009) is present:

RE 1.11.2x2a - *Acacia shirleyi* (lancewood) open forest on skeletal soils and earths on metamorphic hills.

The canopy layer (2-7m) is of a medium density and is dominated by *Acacia shirleyi* (lancewood). The shrub layer (0.5-2m) is extremely sparse and dominated by juvenile *Acacia shirleyi* and *Eremophila maculata* (spotted fuchsia bush). The ground layer (0-0.5m) is sparse and dominated by *Triodia molesta* (pincushion spinifex).

Small areas of this RE occur within rocky ridges and steep slopes of Mt Elliott 4 and 5.

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.11.2, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.11.2 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

RE1.11.2x2a burns between the onset of the wet and the dry and requires fire for recruitment. However burning intervals needs to be long, typically not being burnt less than once every 30 years to maintain health.

3.2.1.1 Summary of Effects

No potential environmental constraints were identified within the Mt Elliott Investigation Area. It is considered that no flora species, communities or ecosystems listed as significant under the NC Act, VM Act or EPBC Act will be adversely affected by any proposed development or activities within the Mt Elliott MLs.

3.2.1.2 Recommendations

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Mt Elliott MLs. A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance, as well as enable the mapping of the complete extent of RE 1.3.7. This will be necessary to accurately determine this vegetation community's remnant status.

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities in the event of any further mining activities within the MLs.

3.2.2 Fauna and Habitats

A detailed description of all habitat types and their interaction with the landscape and potential to support faunal communities for each ML of the Mt Elliot group has been defined.

3.2.2.1 Habitats

Mt Elliot 1

North eastern portions of the Mount Elliot 1 ML is characterised by moderate to steep undulating slopes dominated by small *Triodia molesta* (pincushion spinifex) clumps and a sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). Northern portions of the ML also comprise areas of incised drainage lines that dissect higher quality undulating habitat. These drainage lines predominately flow in a north-south direction, and are generally dominated by *Triodia molesta* (pincushion spinifex) clumps and an occasional moderate density of *Acacia chisholmii* (Chisholm's wattle) on alluvium covered in small stones and pebbles. These areas provide corridor connectivity and forage and nesting habitat for a range of fauna.

Situated within the undulating plains of the MLs north-west, there are a number of smaller rocky peaks containing small to medium crevices and caves. In addition to the nearby drainage lines, these areas provide high quality habitat for small to medium terrestrial fauna.

High level anthropogenic disturbance occur throughout the majority of the central and southern portions of the ML. Tunnel associated with the old smelting plant provides roosting habitat for microchiropteran bat species, identified as *Taphozous georgianus*

(common sheath-tail bat). A large sink hole area dominates eastern portions of the ML, and contains good native vegetation regeneration. With further regeneration and collapsed ground state, this area may provide high quality sub-surface soil hollows suitable for terrestrial mammal and reptile species.

Southern portions of the ML generally comprise of undulating hills with sparse *Eucalyptus leucophloia* (snappy gum) canopy and moderate *Triodia molesta* (pincushion spinifex) cover surrounding large rocky ridges containing small to large crevices and caves. These higher rocky ridges provide high quality habitat for a range of small to large terrestrial fauna species. Southern portions of the ML are also subjected to previous and currently used access roads. A single lower alluvial channel dominated by a sparse *Eucalyptus camaldulensis* (river red gum) canopy on soft sandy soils dissects south-west portions of the ML, and potential provides corridor connectivity and burrowing soils for terrestrial fauna.

Mt Elliot 2

The majority of low lying areas within the Mount Elliot 2 ML is subject to previous disturbance, rock dumps or current operations. For the most part, southern portions of the ML contains very sparse to cleared vegetation. Two alluvium drainage lines running west to east dissect the ML in the southern and central portions. These drainage lines are generally dominated by medium sized *Triodia molesta* (pincushion spinifex) clumps and an occasional moderate density of *Acacia chisholmii* (Chisholm's wattle) and *Acacia cambagei* (gidgee) on alluvium covered in small stones and pebbles. Due to the high amount of surrounding disturbance, these areas provide the highest quality forage, nesting and movement habitat for terrestrial fauna.

A large area within the central-western portion of the ML, as well as three smaller areas in the north is dominated by moderately steep undulating plains, which are subjected to past and recent disturbance. Despite this, these areas are subject to significant native regeneration and continued recruitment of vegetative cover. This regeneration will in time provide a good native ecosystem and avoid to the loss of soils.

The remainder of the northern, eastern and southern portions of the ML are void of significant vegetation and appear to be subject to minor recent works and a network of access roads.

Mt Elliot 3

Southern portions of the Mount Elliot 3 ML consist predominately of gently undulating plains to steeper foothills associated with rocky jump-ups and higher rocky peaks. The lower undulating plains are dominated by sparse small *Triodia molesta* (pincushion spinifex) clumps and a sporadic canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). Apart from providing movement habitat for a number of mobile fauna species, these areas provide limited quality habitat features. Higher quality fauna habitat in the southern portions of the ML exists in the higher rocky peaks and associated foothills. There are a number of small and elongated exposed rocky outcrops containing a number of crevices and small caves which provide a high quality habitat for a number of terrestrial species. In particular, a single wide rocky peak exists near the eastern boundary of the ML, and contains numerous small and large crevices and deeper caves. In addition to smaller fauna species, this area provides quality shelter habitat for larger terrestrial fauna. These areas of exposed metamorphic rock are surrounded by steeper sloping foot hills with a dense *Triodia molesta* (pincushion spinifex) ground cover with a sporadic/spare *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle) canopy. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and passerine avifauna.

Large plain areas occurring throughout the remainder of the ML's central and northern portions are consistent with broader basin areas of the range. These areas are generally dominated by dense *Triodia molesta* (pincushion spinifex) and sparse to moderate canopy species which is usually dominated by *Eucalyptus leucophloia* (snappy gum), *Corymbia terminalis* (western bloodwood), and in some areas *Acacia chisholmii* (Chisholm's wattle) and *Acacia cambagei* (gidgee). These areas are dissected by a numerous large riparian channels and associated lower alluvial drainage lines. A single wide riparian channel exists in the northern portion of the ML, before splitting into a further three. These channels have a dominant canopy of *Eucalyptus camaldulensis* (river red gum) on course alluvium and clay soils, and have the potential to contain old growth vegetation. These features provide corridor connectivity and very high quality forage and nesting habitat for a range of small to large fauna species. There are a number of lower alluvial drainage lines that further dissect the ML's central and eastern flatter plains. These areas are dominated by a groundcover of *Triodia molesta* (pincushion spinifex) clumps on sandy/stony soils. In some areas, soils consist of softer sands that provides potential burrowing habitat for smaller terrestrial fauna. These drainage lines further extent potential fauna corridor connectivity throughout the landscape from larger riparian channels.

Mt Elliot 4

Northern portions of the Mount Elliot 4 ML predominately comprise of large areas of undulating slopes and plains with a sparse to moderately dense *Triodia molesta* (pincushion spinifex) ground cover, and a sporadic/sparse *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle) canopy. These plains surround a number of rocky jump-ups and outcrops containing small crevices and shallow caves that provide high quality habitat for smaller terrestrial fauna.

The central portions of the ML is dominated by a number of larger peak ridge lines predominately facing east-west, and contain large and small boulders areas, as well as areas of large and small crevices and caves. These ridge lines provide the highest quality habitat for a range of small to large terrestrial fauna. Ridge lines in central portions of the ML are surrounded by undulating plains incised by lower drainage lines. These drainage lines are generally dominated by *Triodia molesta* (pincushion spinifex) clumps and an occasional moderate density of *Acacia chisholmii* (Chisholm's wattle) and *Acacia cambagei* (gidgee) on soft alluvium soils. These lower alluvium drainage lines provide potential corridor connectivity, and burrowing habitat for a range of terrestrial fauna.

Southern portions of the ML are dominated by mild undulating slopes dominated by small *Triodia molesta* (pincushion spinifex) clumps and a sparse *Eucalyptus leucophloia* (snappy gum) canopy. The areas surround a lower wide alluvial channel with fine sandy soils running from west to east. This channel is densely vegetated by *Eucalyptus normantonensis* (Normanton box) and emergent *Corymbia terminalis* (western bloodwood). These areas provide high quality forage, nesting and movement habitat for a range of fauna species. Also characterising the southern portions of the ML is one large central rocky jump-up containing numerous small crevices and shallow caves. Similar to other portions of the ML, this rocky area provides high quality habitat for smaller terrestrial fauna.

There is a small area of disturbance associated with the old Selwyn Township in the south-eastern portion of the ML. This area contains very sparse occurrences of *Triodia molesta* (pincushion spinifex) clumps and canopy species including *Eucalyptus leucophloia* (snappy gum).

Mt Elliot 5

The entire Mount Elliot 5 ML consists primarily of flat to gently undulating plains centred on a number of higher rocky ridges and peaks. The lower undulating plains are dominated by sparse small *Triodia molesta* (pincushion spinifex) clumps and a sporadic

canopy of *Eucalyptus leucophloia* (snappy gum) and *Eucalyptus normantonensis* (Normanton box) on sandstone geology. These areas are located primarily along the ML's boundaries and apart from providing movement habitat for a number of mobile fauna species, the softer sandstone soils may provide burrowing habitat in areas for smaller terrestrial fauna.

The highest quality fauna habitat exists through the central portions of the ML aligned with high rocky peaks and steep foothills. There are three large and elongated east-west facing peaks, all of which contain numerous boulder piles, small and large crevices, and shallow to deep caves. Unlike the majority of rocky ridge in the region, these are dominated by a moderately dense cover of *Acacia torulosa* (no common name) with sporadic *Eucalyptus normantonensis* (Normanton box). These habitat features provide high quality shelter and refuge habitat for a range of small to larger terrestrial fauna species. These areas of exposed metamorphic rock are surrounded by steeper sloping foot hills, and generally dominated by a dense *Triodia molesta* (pincushion spinifex) ground cover with a sporadic/spare *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle) canopy. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and passerine avifauna.

A number of lower alluvial channels and drainage lines dissect central portions of the ML. On the western boundary there is a wide alluvial flat with sandy soils densely vegetated with *Eucalyptus normantonensis* (Normanton box) and emergent *Corymbia terminalis* (western bloodwood). This area provides habitat for a range of smaller avifauna and potential burrowing soils for smaller terrestrial mammals. The eastern boundary of the ML is dissected by a number of narrow incise drainage lines. These areas are predominately dominated by *Triodia molesta* (pincushion spinifex) clumps with occasional occurrences of *Acacia chisholmii* (Chisholm's wattle) on stony soils. The vegetated drainage lines throughout the ML have the potential to provide corridor connectivity and quality forage and shelter habitat for a range of fauna species.

3.3 Lady Ella

The Lady Ella Mining Lease Areas comprising a total area of 148 ha.

3.3.1 Vegetation and Regional Ecosystems

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation type over most of the Access Road. The shrub layer is dominated by species of the genera *Acacia* and *Senna*. The seasonally depauperate ground layer is predominantly dominated by *Triodia molesta* (pincushion spinifex).

Minor drainage lines are dominated by a narrow *Eucalyptus camaldulensis* (river red gum) woodland which has a typically sparse shrub layer dominated by *Acacia chisholmii* (Chisholm's wattle) and a ground layer dominated by the exotic species **Pennisetum ciliare* (buffel grass).

Three analogous regional ecosystems (**Figure 9**) are present within the Lady Ella Group. These include: RE1.3.7 on active alluvium within watercourses. The *Eucalyptus leucophloia* (snappy gum) woodland can be separated into two REs based on geology; RE1.10.4 is found on skeletal soils and earths on sandstone plateaux and RE1.11.2 is present on metamorphic geologies. Within RE1.11.2 one major vegetation community recognised by the Queensland Herbarium (2009) has been identified; RE1.11.2x2a.

With the exception of RE1.3.7, all REs carry a vegetation management status of *Least Concern* and a Biodiversity status of *No Concern at Present* which are the lowest conservation significance levels (greater than 30% of the pre-settlement RE remains). RE1.3.7 carries a management status of *Least Concern* and a biodiversity status of *Endangered*.

None of these are considered threatened ecological communities at a national level under the EPBC Act.

The composition of the dominant species in each RE across the Lady Ella ML is described below.

RE 1.3.7 - *Eucalyptus camaldulensis* (river red gum) woodland on channels and levees in south of bioregion.

Description

A small area of this RE exists in the south-west corner of Lady Ella (**Figure 9**). This community typically occurs on recent levees and channel deposits of larger tributaries, primarily on alluvial soils.

Structure

The canopy layer (3-12m) is sparse to medium and dominated by *Eucalyptus camaldulensis* (river red gum). The shrub layer (0.5-2m) is extremely sparse to medium and is dominated primarily by *Acacia chisholmii* (Chisholm's wattle). The ground layer (0-0.5m) is very sparse to sparse and dominated by *Triodia molesta* (pincushion Spinifex) in the denser, stonier substrates and **Pennisetum ciliare* (buffel grass) in areas with more alluvial soil. Native Poaceae species such as *Aristida inequiglumis* (feather-top three-awn) also occasionally occurs within this community.

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *Endangered*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.3.7 is considered *Endangered* under DERM's biodiversity assessment on account of regional degradation of this RE by high total grazing pressure (direct impacts associated with trampling, secondary impacts associated with exotic pasture species introductions principally **Pennisetum ciliare* (buffel grass) and tertiary impacts associated with altered fire regimes (arising from buffel grass which carries a greater biomass than undisturbed systems) and habitat alteration).

Natural examples of these systems do burn patchily due to low flammability and small fuel loads, however they should not be targeted for prescribed burning. This is particularly pertinent for waterways containing **Pennisetum ciliare* (buffel grass) which significantly contributes to the fuel load and exacerbates the vulnerability of these areas to fire.

Although these analogous REs fulfil criteria for remnant status, their extent within the landscape would generally make them too small to map at the scales utilised by DERM. Despite this they should be treated as functioning representations of RE1.3.7 and management considerations appropriate for them apply.

RE 1.10.4 - *Eucalyptus leucophloia* (snappy gum) and/ or *Acacia* spp. low open woodland on stony sandstone plateaus

Description

This RE occurs in the north-west corner of the Lady Ella ML (**Figure 9**). This community occurs on residual plateaus and scarps on or near horizontally bedded sandstones and conglomerates and skeletal soils.

Structure

The canopy layer (2-8m) is sparse and is dominated by *Eucalyptus leucophloia* (snappy gum). The shrub layer (0.5-2m) is sparse and dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Senna artemisioides* subsp. *oligophylla* (limestone cassia). The ground layer (0-0.5m) is of a medium density and is dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

RE1.10.4 has a management status of *Least Concern* and a biodiversity status of *No Concern at Present*.

Notes

RE1.10.4 is a very sparse community occurring on stony sandstone plateaus with the structure occasionally being dominated by Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every year, but also ensuring some patches are long unburnt. Annual burnt areas should be less than 30%.

RE 1.11.2 - *Eucalyptus leucophloia* (snappy gum) low open woodland

Description

This RE is the dominant community within the Lady Ella ML, extending across the south, centre and part of the north of the site (**Figure 9**). This community typically occurs on

hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths.

Structure

The canopy layer (2-8m) is very sparse to sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Acacia shirleyi* (lancewood). The shrub layer (0.5-2m) is extremely sparse to sparse and is dominated by *Acacia macradenia* (zigzag wattle) with associated *Acacia chippendalei* (Chipendale's wattle). The ground layer (0-0.5m) is medium to dense and dominated by *Triodia molesta* (pincushion spinifex).

One major vegetation recognised by the Queensland Herbarium (2009) is present:

RE 1.11.2x2a - *Acacia shirleyi* (lancewood) open forest on skeletal soils and earths on metamorphic hills.

The canopy layer (2-7m) is of a medium density and is dominated by *Acacia shirleyi* (lancewood). The shrub layer (0.5-2m) is extremely sparse and dominated by juvenile *Acacia shirleyi* and *Eremophila maculata* (spotted fuchsia bush). The ground layer (0-0.5m) is sparse and dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.11.2, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.11.2 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

RE1.11.2x2a burns between the onset of the wet and the dry and requires fire for recruitment. However burning intervals needs to be long, typically not being burnt less than once every 30 years to maintain health.

3.3.1.1 Summary of Effects

No potential environmental constraints were identified within the Lady Ella ML. With reference to Queensland's NC Act and VM Act and the Commonwealth's EPBC Act it is considered that no listed flora species, communities or ecosystems will be adversely affected by any proposed development or activities within the site.

3.3.1.2 Recommendations

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Lady Ella ML. A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance, as well as enable the mapping of the complete extent of RE 1.3.7. This will be necessary to accurately determine this vegetation community's remnant status. A post-wet season flora survey will also need to be carried out across all of the MLs, to ascertain the presence/absence of those flora species not readily detectable during the dry season (herbs, forbs etc).

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities.

3.3.2 Fauna and Habitats

A detailed description of all habitat types and their interaction with the landscape and potential to support faunal communities for each ML of the Lady Ella group has been defined.

3.3.2.1 Habitats

The Lady Ella ML has been subject to previous mining activities. These activities have been focused in the central portions of the ML. Mineral extraction in the centre of the site is evident from a circular pit occurring, which currently acidic water (note: water quality has been shown to be low). The extraction pit currently has vertical slopes with exposed metamorphic rock with little to no vegetation cover. Only a limited number of vehicular access tracks and haulage roads occur throughout the majority of the disturbance area, connecting the extraction pit to the large rock/tailings dump immediately to the north. The site's disturbance areas are accessed only from the south by one main Access Road which joins the main Access Road to the south-west outside of the ML. The majority of the disturbance is localised and focused on the extraction pit, access trails and the rock/tailings pile.

The eastern side of the ML contains predominately steep sloping foothills associated with two elongated rocky ridges. Each elongated exposed rocky outcrop contains a number of crevices and small caves that provide high quality habitat for a number of terrestrial species. These areas of exposed metamorphic rock are surrounded by steeper sloping foot hills with a dense *Triodia molesta* (pincushion spinifex) ground cover with a sporadic/spare *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle) canopy. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and passerine avifauna.

The western side of the ML contains a greater number of significantly higher rocky peaks than the eastern side. These include rocky peaks that contain numerous small and large crevices and deeper caves. In addition to smaller species, this area provides quality shelter habitat for larger terrestrial fauna. These areas of exposed metamorphic rock are surrounded by similar steep sloping foot hills to the eastern side of the ML, with a dense *Triodia molesta* (pincushion spinifex) ground cover with a sporadic/spare *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle) canopy. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and passerine avifauna.

The north-east corner of the ML contains a number of higher slope gullies which are aligned with the drainage lines from the upper slopes. These areas have a very rocky surface on fine alluvial sands, and are dominated by dense clumps of medium sized *Triodia molesta* (pincushion spinifex) and *Acacia chisholmii* (Chisholm's wattle) clumps. There are some instances where sparse canopy species *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) s are present. These areas provide high quality forage and shelter habitat for cryptic avifauna and small terrestrial mammals, as well as corridor connectivity from higher slopes to flatter plains. The higher slope gullies flow into a north-south lower alluvium drainage line. This drainage line is dominated by small to medium *Triodia molesta* (pincushion spinifex) clumps and occasional *Acacia chisholmii* (Chisholm's wattle) on fine alluvium sands covered in stones and pebbles. This area provides further corridor connectivity and forage and shelter habitat for small terrestrial fauna and avifauna.

3.4 Mount Dore

The Mount Dore Group comprises 7 separate Mining Lease Areas comprising a total area of 897 ha.

3.4.1 Vegetation and Regional Ecosystems

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation type over most of the group, with *Acacia cambagei* (gidgee) and *Corymbia terminalis* (western bloodwood) becoming common in the south-east and north. A shrub layer of extra sparse to medium density is dominated by *Acacia chisholmii* (Chisholm's wattle). The ground layer is dominated by *Triodia molesta* (pincushion spinifex) with associated native Poaceae species in areas of undifferentiated colluvium, skeletal soils and red earths (Landzone 5).

Four analogous REs (**Figure 10**) are present in the Mt Dore Group. There's are variants of *Eucalyptus leucophloia* (snappy gum) woodland functionally separated on the basis of geology: RE1.5.3 on colluviums, skeletal soils and red of lower slopes; RE1.11.2 on hills and upper slopes of strongly folded metamorphic pre-Cambrian rocks; and RE1.12.1 on skeletal soils and some shallow red earths on stony hills and rises on igneous rocks. The RE not dominated by *Eucalyptus leucophloia* (snappy gum) is associated with dry river bed in the south of MLs Mt Dore 4 and 5. This RE is described as RE 1.3.7 *Eucalyptus camaldulensis* (river red gum) woodland on channels and levees in south of bioregion

RE 1.3.7 - *Eucalyptus camaldulensis* (river red gum) woodland on channels and levees in south of bioregion.

Description

A small area of this RE exists in the south of Mt Dore 4 and 5, associated with a dry river bed (**Figure 10**). This community typically occurs on recent levees and channel deposits of larger tributaries, primarily on alluvial soils.

Structure

The canopy layer (3-12m) is sparse to medium and dominated by *Eucalyptus camaldulensis* (river red gum). The shrub layer (0.5-2m) is extremely sparse to medium and is dominated primarily by *Acacia chisholmii* (Chisholm's wattle). The ground layer (0-0.5m) is very sparse to sparse and dominated by *Triodia molesta* (pincushion Spinifex) in the denser, stonier substrates and **Pennisetum ciliare* (buffel grass) in areas with more alluvial soil. Native Poaceae species such as *Aristida inequiglumis* (feather-top three-awn) also occasionally occurs within this community.

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *Endangered*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.3.7 is considered *Endangered* under DERM's biodiversity assessment on account of regional degradation of this RE by high total grazing pressure (direct impacts associated with trampling, secondary impacts associated with exotic pasture species introductions principally **Pennisetum ciliare* (buffel grass) and tertiary impacts associated with altered fire regimes (arising from buffel grass which carries a greater biomass than undisturbed systems) and habitat alteration).

Natural examples of these systems do burn patchily due to low flammability and small fuel loads, however they should not be targeted for prescribed burning. This is particularly pertinent for waterways containing **Pennisetum ciliare* (buffel grass) which significantly contributes to the fuel load and exacerbates the vulnerability of these areas to fire.

Although these analogous REs fulfil criteria for remnant status, their extent within the landscape would generally make them too small to map at the scales utilised by DERM. Despite this they should be treated as functioning representations of RE1.3.7 and management considerations appropriate for them apply.
Need to insert RE1.3.7 section

RE 1.5.3 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on red earths on plateaus.

Description

This RE occurs in the south east and north-west of the Mt Dore MLs, including MLs 1, 4, 5 and 7 (**Figure 10**). This community typically occurs on undulating plateau surfaces and on hills and ranges on strongly folded metamorphic pre-Cambrian rocks, with lateritic red earths, small areas of shallow sandy loams and skeletal soils.

Structure

The canopy layer (2-10m) is sparse to very sparse and is co-dominated by *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) with *Acacia cambagei* (gidgee) becoming common on the upper slopes of the ridgelines. The shrub layer (0.5-2m) is very sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia* spp. and *Senna* spp. The ground layer (0-0.5m) is medium to

dense and dominated by *Triodia molesta* (pincushion spinifex) with associated native Poaceae species.

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.5.3 occurs on undulating plateau surfaces; lateritic red earths, and small areas of shallow sandy loams and skeletal soils.

A number of drainage lines are present within this RE type. Whilst floristic diversity is much simplified when compared to that of the surrounding (broader RE) no major communities are recognised by the Queensland herbarium (2009) for this RE type.

Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every year, but also ensuring some patches are long unburnt. Annual burnt areas should be less than 30%.

RE 1.11.2 - *Eucalyptus leucophloia* (snappy gum) low open woodland

Description

This RE extends throughout the majority of the western section of the Mt Dore ML's, including much of MLs 1, 3, and 6 and also occurring in smaller areas in MLs 2, 4 and 7 (**Figure 10**). This community typically occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths.

Structure

The canopy layer (2-8m) is very sparse to sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Eucalyptus normantonensis* (Normanton Box). The shrub layer (0.5-2m) is extremely sparse to very sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia macradenia* and *Senna* spp. The ground layer (0-0.5m) is medium to dense and dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.11.2, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.11.2 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

RE1.11.2x2a burns between the onset of the wet and the dry and requires fire for recruitment. However burning intervals needs to be long, typically not being burnt less than once every 30 years to maintain health.

RE 1.12.1 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on granites.

Description

This RE occurs across the majority of Mt Dore 2 and the northern sections of Mt Dore 4 and 7 (**Figure 10**). This community typically occurs on ranges and stony hills and rises on igneous rocks, skeletal soils and some shallow red earths.

Structure

The canopy layer (2-9m) is extremely sparse to very sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Eucalyptus normantonensis* (Normanton Box) and *Corymbia terminalis* (western bloodwood). The shrub layer (0.5-2m) is extremely sparse to medium and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia* spp. and *Senna* spp. The ground layer (0-0.5m) is medium to dense and dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

RE1.12.1 has a management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.12. 1, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the early dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.12.1 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

3.4.1.1 Summary of Effects

No potential environmental constraints were identified within the Mt Dore Investigation Area. It is considered that no flora species, communities or ecosystems listed as significant under the NC Act, VM Act or EPBC Act will be adversely affected by any proposed development or activities within the site.

3.4.1.2 Recommendations

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Mt Dore MLs (with the exception of Mt Dore 1). A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance. A post-wet season flora survey will need to be carried out across all of the MLs, to ascertain the presence/absence of those flora species not readily detectable during the dry season (herbs, forbs etc).

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities.

3.4.2 Fauna and Habitats

A detailed description of all habitat types and their interaction with the landscape and potential to support faunal communities for each ML of the Mt Dore group has been defined.

3.4.2.1

Habitats

Mt Dore 1 (Impact Area)

The western portions of the Mount Dore 1 ML are dominated by a main range running north-south. These areas contain higher rocky escarpments and associated steep foothills and extensive flood areas. The higher rocky escarpments are sparsely vegetated with a ground cover of *Triodia molesta* (pincushion spinifex) and canopy of *Eucalyptus leucophloia* (snappy gum) due to the lack of soil. There are a number of rock piles, crevices and very small caves present throughout these areas, in particular the higher ridgelines. The presence of these habitat features correlates with the capture of a number of smaller terrestrial mammals (e.g. common rock-rat) during the current survey effort. Despite this, the rocky ridgelines within the Mount Dore 1 ML do not contain any larger crevices and deep caves such as those found in other ranges in the region. Due to this there was a notably reduced number of larger terrestrial fauna (e.g. macropods) recorded in these areas.

There were a number of eroded gully areas present within the steeper foothills. These areas primarily contained large rocky incise banks that provide high quality habitat for small terrestrial fauna. Similar to the higher rocky ridges, there were a number of small mammals captures recorded in these areas during the current survey (e.g. common rock-rat).

The lower slopes and foothills through the central portions of the ML provide a mixture of good habitat types from the aforementioned rocky slopes and gullies to densely vegetated undulating hills. Higher quality habitat throughout these areas is abundant due to variations in topographical features and associated floristic composition. The larger *Triodia molesta* (pincushion spinifex) clumps and dense *Acacia chisholmii* (Chisholm's wattle) and *Acacia cambagei* (gidgee) strands on sloping foothills provide high quality habitat for small terrestrial and passerine species.

There are a small number of knolls which occur in the northern and central portions of the ML which contain rocky outcrops associated with their peaks. These areas provide similar habitat features to those founding the higher escarpments, however are unlikely to support a high density of smaller terrestrial fauna given the lack of connectivity with higher quality habitat. There are a number of vehicular access tracks that have been previously cut across the ML from the west to east.

The lower alluvial flats and plains within the western portions of the ML provide little habitat structure, with numerous cleared patches of red soil and very little canopy cover. These areas are primarily dominated by white wispy grasses and occasional *Triodia molesta* (pincushion spinifex) clumps on stony soils.

Mt Dore 2

The majority of the southern portions of the Mount Dore 2 ML are subject to current mining exploration activities. As a result of this there is a high density of currently utilised vehicular access roads causing a limited amount of vegetation in the area. There are three small rocky jump-ups situated within the network of roads. These provide small rocky crevices and shallow caves which could provide shelter habitat too small to medium terrestrial fauna. The quality of these habitat features would have been reduced due to the surrounding disturbance.

South-east portions of the ML are dominated by a substantial steep rocky ridge that provides a number of larger crevices and caves and sparse groundcover of *Triodia molesta* (pincushion spinifex). This area provides much increase quality in forage, and

nesting habitat for a vast range of small to large fauna species than those areas associated with the disturbance nearby.

The north-western boundary of the ML contains a high elongated rocky ridge with small boulder piles and crevices. These areas provide suitable shelter habitat for a number of smaller terrestrial fauna. Leading down from the rocky ridges are steep sloping foothills dominated by dense clumps of *Triodia molesta* (pincushion spinifex) and a sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). This vegetation structure provides higher quality habitat for small terrestrial fauna movement, as well as forage and nesting habitat for smaller passerine avifauna.

The majority of the northern areas of the ML is dominated by gently undulating hills with a moderately dense groundcover of *Triodia molesta* (pincushion spinifex) and sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). There are a number of channels and gullies which dissect the northern portions of the ML. A single large riparian channel dominated by *Eucalyptus camaldulensis* (river red gum) on fine sandy soil exists in the far north-western corner. This channel branches into two lower alluvial drainage lines which extend through the flatter plains. These areas are generally dominated by rocky soils with *Triodia molesta* (pincushion spinifex) clumps; however the occasional area of *Acacia chisholmii* (Chisholm's wattle) can be present. The channel and drainage areas throughout the ML provide potential forage, nesting and movement habitat for a range of small to large terrestrial fauna.

Mt Dore 3

The eastern side of the Mount Dore 3 ML contains a number of small rocky peaks in the south and one elongated ridge line in the north. These higher peaks and ridges are surrounded by steeper foothills. Each exposed rocky outcrop contains a number of crevices and small caves that provide high quality habitat for a number of terrestrial species. These areas of exposed metamorphic rock are surrounded by steeper sloping foot hills with a dense *Triodia molesta* (pincushion spinifex) ground cover with a sporadic/sparse *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle) canopy. These areas provide higher quality forage, nesting and movement habitat for a number of small terrestrial fauna and passerine avifauna. There are large higher slope gullies in the southern portions of the ML associated with the drainage lines from the upper slopes. These gullies have a very rocky surface on fine alluvial sands, and are dominated by dense clumps of medium sized *Triodia molesta* (pincushion spinifex) and *Acacia chisholmii* (Chisholm's wattle) clumps. There are some instances where sparse canopy species *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) are present. These areas provide high quality forage and shelter habitat for cryptic avifauna and small terrestrial mammals, as well as corridor connectivity from higher slopes to flatter plains.

Higher slope gullies in the south branch into a number of narrower lower alluvial drainage lines which extend throughout the flatter plains in central and northern portions of the ML. These drainage lines are dominated by small to medium *Triodia molesta* (pincushion spinifex) clumps and occasional *Acacia chisholmii* (Chisholm's wattle) on fine alluvium sands covered in stones and pebbles. The vegetated drainage lines provide further corridor connectivity and forage and shelter habitat for small terrestrial fauna and avifauna throughout the ML.

The western side of the ML is predominately dominated by flat to slightly undulating plains. These areas contain a moderately dense groundcover of *Triodia molesta* (pincushion spinifex) with occasional clumps of *Acacia chisholmii* (Chisholm's wattle), and a sporadic canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). Forage and nesting habitat in open plains is generally low, however these areas will be used by highly mobile fauna species for movement.

Mt Dore 4

The far south-western corner of the Mount Dore 4 ML has the northern areas of the currently operating mine camp. This area contains little vegetation cover; however is a very small portion of the ML. The majority of the southern portion of the ML consist of flat to gently undulating plains on sandy/stony soils dominated by a moderately dense groundcover of *Triodia molesta* (pincushion spinifex) clumps, and a sporadic canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). These undulating plains consist of one small rocky jump up and one small higher rocky peak. The latter contain more exposed rocky outcrops with a number of crevices and small caves which provide a high quality habitat for a number of terrestrial species.

A single large riparian channel dominated by *Eucalyptus camaldulensis* (river red gum) on fine sandy soil dissects the southern portions of the ML. This channel forms two branches through the central portions of the ML, before becoming two lower alluvial drainage lines which extend through the flatter northern plains. These drainage areas are generally dominated by rocky soils with *Triodia molesta* (pincushion spinifex) clumps; however the occasional area of *Acacia chisholmii* (Chisholm's wattle) can be present. These channel and drainage areas throughout the ML provide potential forage, nesting and movement habitat for a range of small to large terrestrial fauna. In particular the wider riparian channels that have the potential to contain old growth vegetation that may provide preferred nesting habitat for a range of larger avifauna species.

The majority of the central and northern portions of the ML are dominated by a large area of disturbance. Past and current exploration activities have resulted in a dense network of access roads and little vegetation cover on exposed metamorphic rock. There are a number of areas that have been subject to native regeneration and are continuing to recruit vegetative cover. This regeneration will in time provide a good native ecosystem and avoid to the loss of soils. The regularly used access roads and operational areas will remain for the most part void of vegetation.

There are six higher rocky peaks, including one elongated ridge, which exists in the northern portion of the ML. These areas contain high quality habitat for a range of smaller terrestrial fauna by providing a number of small rock piles, crevices and caves. It is likely that habitat quality will be greater in rocky peaks and ridges which exist near the eastern boundary of the ML, outside of the disturbance area.

Mt Dore 5

Northern portions of the Mount Dore 5 ML is dominated by disturbance areas (active mine camp) a lower undulating landscape containing a sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) , and sparse ground cover of small *Triodia molesta* (pincushion spinifex) clumps.

The majority of central portions of the ML is characterised by gentle undulating plains dominated in most areas by *Eucalyptus leucophloia* (snappy gum) and sparse *Triodia molesta* (pincushion spinifex) clumps, and occasionally by dense clumps of *Acacia chisholmii* (Chisholm's wattle). A large band of low-lying rocky hills and slopes dissect central and southern portions of the ML. These areas contain numerous rocky piles, small crevices and shallow caves, which provide potential habitat for a range of terrestrial fauna.

There a number of small drainage lines extend through western portions of the ML. These drainage lines are generally dominated by *Triodia molesta* (pincushion spinifex) clumps and an occasional moderate density of *Acacia chisholmii* (Chisholm's wattle) on alluvium covered in small stones and pebbles. Predominately, the smaller drainage lines branch from larger alluvial areas dominated by *Eucalyptus camaldulensis* (river red gum) or *Eucalyptus normantonensis* (Normanton box). These larger areas contain fine sandy

soils, and contain the highest quality forage, nesting and movement habitat for a range of small to large terrestrial fauna.

South east areas of the ML is dominated by a mixture of gentle undulating plains containing sparse *Triodia molesta* (pincushion spinifex) clumps and *Eucalyptus leucophloia* (snappy gum) vegetation, and disturbance areas from past operations.

Mt Dore 6

Large southern portions of the Mount Dore 6 ML are subject to disturbance with fine tailings between rocky peaks to form a very high flat pad.

The majority of the central to eastern portions of the ML is dominated by very high undulating rocky ridges containing stony outcrops and numerous small to large crevices and caves. The rocky peaks of the range contain steep slopes which form scoured and rocky creek-lines throughout the slopes and undulating landscape. On top of the rocky ridges, these creek-lines create high quality habitat for fauna species reliant on crevices and rocky areas.

Sloping areas to the east of the ML quickly form undulating plains that are dominated for the most part by *Acacia chisholmii* (Chisholm's wattle). There are many ephemeral over land flow paths which traverse the ML from west to east before converging into a larger alluvial tributary in the east that extends from the base of the disturbance pad. This main drainage line is dominated by a canopy of *Eucalyptus normantonensis* (Normanton box) and softer sandy soils, and combined with the aforementioned smaller drainage lines, provide quality forage, burrowing and movement habitat for a range of terrestrial fauna.

Western portions of the ML extending to the north, is dominated by moderate to steep sloping foothills containing a sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood), and a high density of small *Triodia molesta* (pincushion spinifex) clumps on rocky soils. This vegetation structure provides higher quality habitat for small terrestrial fauna movement, as well as forage and nesting habitat for smaller passerine avifauna. There are two small rocky ridges situated between these foothills, and these provide a range of boulder piles, and small crevices and shallow caves. These areas provide shelter and forage habitat for small terrestrial fauna.

Mt Dore 7

A large portion of the southern portions of the Mount Dore 7 ML is consistent with a previously disturbed and regenerating landscape. The landform is predominately slightly undulating and has been subject to significant native regeneration and is continuing to recruit vegetative cover. This regeneration will in time provide a good native ecosystem and avoid to the loss of soils. The far south-west corner of the ML is disturbed by currently active operations, and as a result contains limited vegetation cover.

The majority of the central and western portions of the ML are dominated by gently undulating hills containing sparse small to medium *Triodia molesta* (pincushion spinifex) clumps, and a very sparse canopy cover of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). These areas surround one small and three elongated rocky ridges which contain small rock piles and crevices. These features provide high quality shelter habitat for a ranges of smaller terrestrial fauna.

Northern portions of the ML provide the highest quality habitat with vast ranging steep rocky peaks containing an abundance of large boulder piles, crevices, and shallow and deep caves. The presence of a range of features would provide shelter, forage and movement habitat for a large range of small to large fauna species, including the potential for SOCS such as the Purple-necked rock-wallaby.

3.5 Selwyn

The Selwyn Group comprises 3 separate MLs comprising a total area of 2,681 ha.

3.5.1 Vegetation and Regional Ecosystems

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation type over most of the group, with associated *Acacia cambagei* (gidgee), *Eucalyptus normantonensis* (Normanton box) and *Eucalyptus leucophylla* (Cloncurry box) present. A shrub layer of sparse to medium density is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia* spp. and *Senna* spp. Predominates. The medium density ground layer is dominated by *Triodia molesta* (pincushion spinifex).

Four analogous regional ecosystems (**Figure 11**) are present within the Selwyn Group. *Eucalyptus leucophloia* (snappy gum) woodland can be functionally separated on the basis of geology: RE1.5.3 on colluvium, skeletal soils and red earths of lower slopes; RE1.11.2 on hills and upper slopes of strongly folded metamorphic pre-Cambrian rocks; and RE1.12.1 on skeletal soils and some shallow red earths on stony hills and rises on igneous rocks.

RE 1.3.7 - *Eucalyptus camaldulensis* (river red gum) woodland on channels and levees in south of bioregion.

Description

A small area of this RE exists in the west of Selwyn 2 and the south of Selwyn 1 and 3, associated with a dry river bed (**Figure 11**). This community typically occurs on recent levees and channel deposits of larger tributaries, primarily on alluvial soils.

Structure

The canopy layer (3-12m) is sparse to medium and dominated by *Eucalyptus camaldulensis* (river red gum). The shrub layer (0.5-2m) is extremely sparse to medium and is dominated primarily by *Acacia chisholmii* (Chisholm's wattle). The ground layer (0-0.5m) is very sparse to sparse and dominated by *Triodia molesta* (pincushion Spinifex) in the denser, stonier substrates and **Pennisetum ciliare* (buffel grass) in areas with more alluvial soil. Native Poaceae species such as *Aristida inequiglumis* (feather-top three-awn) also occasionally occurs within this community.

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *Endangered*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.3.7 is considered *Endangered* under DERM's biodiversity assessment on account of regional degradation of this RE by high total grazing pressure (direct impacts associated with trampling, secondary impacts associated with exotic pasture species introductions principally **Pennisetum ciliare* (buffel grass) and tertiary impacts associated with altered fire regimes (arising from buffel grass which carries a greater biomass than undisturbed systems) and habitat alteration).

Natural examples of these systems do burn patchily due to low flammability and small fuel loads, however they should not be targeted for prescribed burning. This is particularly pertinent for waterways containing **Pennisetum ciliare* (buffel grass) which significantly contributes to the fuel load and exacerbates the vulnerability of these areas to fire.

Although these analogous REs fulfil criteria for remnant status, their extent within the landscape would generally make them too small to map at the scales utilised by DERM. Despite this they should be treated as functioning representations of RE1.3.7 and management considerations appropriate for them apply.

RE 1.5.3 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on red earths on plateaus.

Description

This RE occurs in the north and south of Selwyn 1 (**Figure 11**). This community typically occurs on undulating plateau surfaces and on hills and ranges on strongly folded metamorphic pre-Cambrian rocks, with lateritic red earths, small areas of shallow sandy loams and skeletal soils.

Structure

The canopy layer (2-10m) is sparse to very sparse and is co-dominated by *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) with *Acacia cambagei* (gidgee) becoming common on the upper slopes of the ridgelines. The shrub layer (0.5-2m) is very sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia* spp. and *Senna* spp. The ground layer (0-0.5m) is medium to dense and dominated by *Triodia molesta* (pincushion spinifex) with associated native Poaceae species.

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.5.3 occurs on undulating plateau surfaces; lateritic red earths, and small areas of shallow sandy loams and skeletal soils.

A number of drainage lines are present within this RE type. Whilst floristic diversity is much simplified when compared to that of the surrounding (broader RE) no major communities are recognised by the Queensland herbarium (2009) for this RE type.

Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every year, but also ensuring some patches are long unburnt. Annual burnt areas should be less than 30%.

RE 1.11.2 - *Eucalyptus leucophloia* (snappy gum) low open woodland

Description

This RE extends throughout the majority of Selwyn 1 and 2 and the eastern portion of Selwyn 2 (**Figure 11**). This community typically occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths.

Structure

The canopy layer (2-8m) is very sparse to sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Eucalyptus normantonensis* (Normanton box) and *Acacia cambagei* (gidgee). The shrub layer (0.5-2m) is very sparse to sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia spp.* The ground layer (0-0.5m) is of a medium density and is dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.11.2, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.11.2 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

RE 1.12.1 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on granites.

Description

This RE occurs across the majority of Mt Dore 2 and the northern sections of Mt Dore 4 and 7 (**Figure 11**). This community typically occurs on ranges and stony hills and rises on igneous rocks, skeletal soils and some shallow red earths.

Structure

The canopy layer (2-9m) is extremely sparse to very sparse and is dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Eucalyptus normantonensis* (Normanton Box) and *Corymbia terminalis* (western bloodwood). The shrub layer (0.5-2m) is extremely sparse to medium and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Acacia* spp. and *Senna* spp. The ground layer (0-0.5m) is medium to dense and dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

RE1.12.1 has a management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.12.1, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the early dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.12.1 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

3.5.1.1 Summary of Effects

No potential environmental constraints were identified within the Selwyn MLs. It is considered that no other flora species, communities or ecosystems listed as significant under the NC Act, VM Act or EPBC Act will be adversely affected by any proposed development or activities within the Selwyn MLs.

3.5.1.2 Recommendations

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Selwyn MLs. A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance, as well as enable the mapping of the complete extent of RE 1.3.7. This will be necessary to accurately determine this vegetation community's remnant status. A post-wet season flora survey will also need to be carried out across all of the MLs, to ascertain the presence/absence of those flora species not readily detectable during the dry season (herbs, forbs etc).

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities.

3.5.2 Fauna and Habitats

A detailed description of all habitat types and their interaction with the landscape and potential to support faunal communities for each ML of the Selwyn ML group has been defined.

3.5.2.1 Habitats

Selwyn 1

South eastern portions of the Selwyn 1 ML are associated with steep foothill areas of a larger mountain range complex running from south to north. The higher rocky ridges contain numerous small to medium sized caves and crevices on the western side of the escarpment. There are a number of eroded gullies that occur along the range providing numerous rocky outcrops along incised bank areas. A large sediment dam dominates the south eastern portions of the valley created by the surrounding mountain ranges. This dam has been subject to sedimentation, however still holds water and provides high quality habitat for a range of water birds species.

South western portions of the ML are dominated by a larger extraction pit and waist rock dump. The base of the rock dump, in particular in association with larger boulder piles, was found to provide high quality shelter habitat for the vulnerable Purple-necked rock-wallaby. A lower alluvium creek line flows to the south of the rock dump, and contains hollow bearing remnant vegetation (*Eucalyptus camaldulensis* river red gum). The presence of this creek line provides high quality habitat for a range of large avifauna and terrestrial fauna species, including further enhancing the habitat quality of the area for the Purple-necked rock-wallaby.

Another steep mountain range running north to south exists on the south western perimeter of the ML. Unlike the ranges present on the eastern side of the ML, these areas contain much larger rock piles and deeper cave structures. Features associated with these ranges provide high quality habitat for small and large terrestrial fauna.

Central portions of the Selwyn 1 ML are dominated by extractive operations and a moderately sloped range which continues north to south. Areas associated with previous and current operations contain a network of vehicular access roads and old workings. Despite the extent of disturbance, the Purple-necked rock-wallaby was recorded utilising larger rock waist piles, and a roost of microchiropteran bats (identified as *Chalinolobus gouldii*) was discovered in old pipe works. A large dam is present within the centre of the

ML, and is surrounded by a dense canopy of moderately aged *Eucalyptus camaldulensis* (river red gum). The younger age of this vegetation means that there are no significant hollows present. Despite this, the permanent freshwater source and abundant vegetation create a very high habitat area for a vast array of fauna species, including migratory and wetland avifauna.

Northern portions of the ML comprise a large mountain range surrounded by steep foothills and gentle undulating plains. The higher areas associated with rocky escarpments contain a number of rocky outcrops and caves. Small amounts of areas on foothills are cleared for drilling exploration, however on the whole the northern portions of the ML is relatively well vegetated with moderately dense *Triodia molesta* (pincushion spinifex) groundcover and sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood).

Selwyn 2

The southern portions of the Selwyn 2 ML is a relatively mountainous undisturbed area dominated by higher rocky peaks, steeper sloping foothills and incised higher slope gullies. The higher rocky peaks contain a mixture of escarpments containing small to larger rock piles, crevices and caves, with sparse *Triodia molesta* (pincushion spinifex) groundcover and very sporadic canopy of *Eucalyptus leucophloia* (snappy gum). These areas provide corridor connectivity and very high quality shelter habitat for a range of small to large terrestrial fauna. The associated steep foothills similarly contain a sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood), but comprise a much denser groundcover of medium sized *Triodia molesta* (pincushion spinifex), and on occasion clump of *Acacia chisholmii* (Chisholm's wattle). These areas provide good quality shelter, forage and movement habitat for small terrestrial and passerine species. There are a number of eroded gullies that occur along the range providing numerous rocky outcrops along incised bank areas, often with a moderately dense canopy of *Acacia chisholmii* (Chisholm's wattle) and *Eucalyptus leucophloia* (snappy gum). These gullies further provide connectivity and habitat features for smaller terrestrial fauna species.

A number of larger course alluvium riparian channels flowing from east to west dissect Southern portions of the ML and surround the aforementioned knolls and foot hills. These channels are dominated by a canopy of *Eucalyptus camaldulensis* (river red gum) and banks of moderate to dense *Triodia molesta* (pincushion spinifex) clumps. These habitat areas should be retained in their current condition as they would benefit fauna by provided potential for older growth vegetation for fauna nesting and foraging, and corridor connectivity. A number of lower alluvium drainage lines extend throughout central and north-eastern portions of the ML. Predominately, southern drainage lines extend from the aforementioned larger riparian channels, further providing potential corridor connectivity and habitat for fauna throughout the landscape. These drainage lines predominately flow in a north-south direction, and are generally dominated by *Triodia molesta* (pincushion spinifex) clumps and an occasional moderate density of *Acacia chisholmii* (Chisholm's wattle) on alluvium covered in small stones and pebbles.

The majority of the eastern border of the ML is dominated by a large slightly undulating area running north to west. This area contains sporadic vegetation coverage of *Triodia molesta* (pincushion spinifex) canopy species including *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) due to past disturbance activities.

Central portions of the site are dominated by slightly undulating plains containing sporadic vegetation coverage of *Triodia molesta* (pincushion spinifex) canopy species including *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). These areas extend further north throughout the remainder of the ML. In the northern portions, there are numerous smaller incised drainage lines which dissect the flatter plains. These drainage lines are dominated by small to medium *Triodia molesta* (pincushion spinifex) clumps and occasional *Acacia chisholmii* (Chisholm's

wattle) and *Acacia cambagei* (gidgee) on fine alluvium sands covered in stones and pebbles. The vegetated drainage lines provide further corridor connectivity and forage and shelter habitat for small terrestrial fauna and avifauna throughout the ML.

There are a small number of knolls which occur in the northern portions of the ML which contain rocky outcrops associated with their peaks. These areas provide similar habitat features to those founding the higher escarpments, however are unlikely to support a high density of smaller terrestrial fauna given the lack of connectivity with higher quality habitat. Directly to the west of these jump-ups, is a large sediment dam created by past disturbance activities. This area is void of any vegetation.

Selwyn 3

The Selwyn 3 ML has not previously been subject to mining activities. The majority of the eastern and western borders of the ML is characterised by large lower undulating slopes and plains with a sparse to moderately dense *Triodia molesta* (pincushion spinifex) ground cover, and a sporadic/spare *Eucalyptus leucophloia* (snappy gum) and *Acacia chilsomii* canopy.

Two medium sized knolls which have exposed rocky outcrops exist in south-western portions of the ML. These knolls contain rocky surfaces and a number of crevices which provide high quality habitat for a number of terrestrial species. These areas of exposed metamorphic rock are surrounded by moderately sloping foot hills with a dense *Triodia molesta* (pincushion spinifex) ground cover with a sporadic/spare *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle) canopy. These areas are likely to provide higher quality habitat for a range of smaller passerine avifauna.

A number of larger course alluvium riparian channels flowing from east to west dissect Southern portions of the ML and surround the aforementioned knolls and foot hills. These channels are dominated by a canopy of *Eucalyptus camaldulensis* (river red gum) and banks of moderate to dense *Triodia molesta* (pincushion spinifex) clumps. These habitat areas should be retained in their current condition as they would benefit fauna by provided potential for older growth vegetation for fauna nesting and foraging, and corridor connectivity. A number of lower alluvium drainage lines extend throughout central and north-eastern portions of the ML. Predominately, southern drainage lines extend from the aforementioned larger riparian channels, further providing potential corridor connectivity and habitat for fauna throughout the landscape. These drainage lines predominately flow in a north-south direction, and are generally dominated by *Triodia molesta* (pincushion spinifex) clumps and an occasional moderate density of *Acacia chisholmii* (Chisholm's wattle) on alluvium covered in small stones and pebbles.

The central and northern portions of the ML consist of a number of elongated peak ridge lines predominately facing north-south, and which contain large and small boulders areas, as well as areas of large and small crevices and caves. These ridge lines provide the highest quality habitat for a range of small to large terrestrial fauna, including the potential for SOCS such as the Purple-necked rock-wallaby. Ridge lines in central portions of the ML are surrounded by steep to moderately sloping foothills dominated heavily by small *Triodia molesta* (pincushion spinifex) clumps and a sparse *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) canopy. Conversely, ridge lines in northern portions of the ML are characterised by steep rocky declines into a lower undulating landscape dominating the majority of the ML.

3.6 Mount Cobalt

Mount Cobalt is a Mining Lease Area of 130 ha.

3.6.1 Vegetation and Regional Ecosystems

Corymbia terminalis (western bloodwood) woodland is the dominant vegetation over most of the ML. Associated with it is *Acacia cambagei* (gidgee), *Eucalyptus leucophylla* (Cloncurry box), *Corymbia aparrerinja* (ghost gum) and *Acacia* spp. (wattle) in the lowlands and *Hakea chordophylla* (bull oak) on the ridgetops. A shrub layer of sparse to medium density is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Senna artemisioides* subsp. *oligophylla* (limestone cassia), *Eremophila longifolia* (berrigan) and *Senna glutinosa* subsp. *pruinosa* (silver cassia). The dense ground layer is dominated by the introduced **Pennisetum ciliare* (buffel grass).

Two analogous regional ecosystems, (**Figure 12**) are present in the Mt Cobalt ML. Undulating plateau's dominated by *Corymbia terminalis* (western bloodwood) comprise RE1.11.3; lower slopes with colluvium and red soils comprise RE1.5.3.

The composition of the dominant species in each RE across the Mt Cobalt ML is described below.

RE 1.5.3 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on red earths on plateaus.

Description

This RE occurs in three small areas in the south and north-east of the site (**Figure 12**). This community typically occurs on undulating plateau surfaces and on hills and ranges on strongly folded metamorphic pre-Cambrian rocks, with lateritic red earths, small areas of shallow sandy loams and skeletal soils.

Structure

The canopy layer (2-8m) is extremely sparse to sparse and is dominated by *Corymbia terminalis* (western bloodwood) with associated *Eucalyptus leucophylla* (Cloncurry box) and *Eucalyptus apperrinja* (ghost gum), with *Acacia cambagei* (gidgee) becoming common in the drainage lines. The shrub layer (0.5-2m) is very sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with *Senna artemisioides* subsp. *oligophylla* (limestone cassia), *Eremophila longifolia* (berrigan) and *Senna glutinosa* subsp. *pruinosa* (silver cassia). The ground layer (0-0.5m) is dense and dominated by **Pennisetum ciliare* (buffel grass).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

RE1.5.3 occurs on undulating plateau surfaces; lateritic red earths, and small areas of shallow sandy loams and skeletal soils.

A number of drainage lines are present within this RE type. Whilst floristic diversity is much simplified when compared to that of the surrounding (broader RE) no major communities are recognised by the Queensland herbarium (2009) for this RE type.

Typically this RE, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

Burn strategy should comprise large landscape scale burns with some patches burnt every year, but also ensuring some patches are long unburnt. Annual burnt areas should be less than 30%.

RE 1.11.3 - *Corymbia terminalis* (western bloodwood) low open woodland on basic metamorphics

Description

This RE extends throughout the majority of the Mt Cobalt ML (**Figure 12**). This community typically occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths.

Structure

The canopy layer (2-6m) is extremely sparse and dominated by *Corymbia terminalis* (western bloodwood) with associated *Hakea chordophylla* (bull oak) on the ridgetops. The shrub layer (0.5-2m) is sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) with associated *Senna artemisioides* subsp. *oligophylla* (limestone cassia). The ground layer (0-0.5m) is of a medium density and is dominated by **Pennisetum ciliare* (buffel grass).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

Management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Naturally very sparse RE type.

Typically RE1.11.3, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the early dry season. Natural burning interval is usually 6-12 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.11.3 burn strategy should comprise large landscape scale burns with some patches burnt every 6-12, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

3.6.1.1 Summary of Effects

No potential environmental constraints were identified within the Mt Cobalt ML. It is considered that no other flora species, communities or ecosystems listed as significant under the NC Act, VM Act or EPBC Act will be adversely affected by any proposed development or activities within the Mt Cobalt ML.

3.6.1.2 Recommendations

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Mt Cobalt ML. A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance. A post-wet season flora survey will also need to be carried out across all of the MLs, to ascertain the presence/absence of those flora species not readily detectable during the dry season (herbs, forbs etc).

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities.

3.6.2 Fauna and Habitats

A detailed description of all habitat types and their interaction with the landscape and potential to support faunal communities the Mt Cobalt ML group has been defined.

3.6.2.1 Habitats

The Mount Cobalt ML has been subject to previous mining. These activities have been focused in the central and southern portions of the ML. Mineral extraction in the south of the site is evident from a number of fenced off open pits, and the remains of old operational structures. The open pits are currently narrow, and have greater than 45 degree slopes. The remaining structures and pit have the potential to provide quality roosting habitat for a range of microchiropteran bats, avifauna, and terrestrial fauna species. A number of vehicular access tracks and haulage roads occur throughout the centre of the site, connecting sites and pits. The site's disturbance areas are accessed from both the north and south by one main road which joins other roads to the north-west outside of the ML. The majority of the disturbance is localised and focused on the pits, mining structures and access trails.

The majority of the ML is dominated by undulating hills containing sparse ground covers of small to medium *Triodia molesta* (pincushion spinifex) and *Pennisetum ciliare* (buffel grass), and sparse canopy vegetation of namely *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood). These areas are generally associated throughout the ML with previous mining disturbance areas. Far south-eastern portions of the ML are dissected by a number of narrow alluvial drainage lines that are dominated

by *Triodia molesta* (pincushion spinifex) clumps and an occasional low density of *Acacia chisholmii* (Chisholm's wattle) on alluvium covered in small stones and pebbles. These drainage lines provide terrestrial fauna with potential corridor connectivity throughout the landscape and into larger vegetated channels off site.

A band of steeper slopes dissecting the entire ML from north to south exists in the western portions. These steeper slopes are situated on stony soils, and are dominated by a moderate density of *Triodia molesta* (pincushion spinifex) clumps, and a mid-storey and canopy of *Acacia chisholmii* (Chisholm's wattle) and *Corymbia terminalis* (western bloodwood) respectively. There is strong evidence of dieback throughout the majority of vegetation associated with these steeper slopes.

Central western portions of the ML contain two small rocky ridges surrounded by steep foothills dominated by sparse *Triodia molesta* (pincushion spinifex) and little to no canopy cover. Each rocky ridge contains a number of small boulder piles and crevices, which are likely to provide shelter habitat for small terrestrial fauna. There is a single large riparian channel dominated by a *Eucalyptus camaldulensis* (river red gum) canopy on fine sandy soils extending from central to northern portions of the ML. This larger riparian channel provides high quality forage, nesting and movement habitat for a range of mammal, reptile, amphibian and avifauna. This main riparian channel branches off at various locations in the north into other wide riparian channels or a number of smaller alluvial /stony drainage lines with a sparse *Triodia molesta* (pincushion spinifex) ground cover and a canopy of sparse *Eucalyptus leucophloia* (snappy gum) , or in areas *Acacia chisholmii* (Chisholm's wattle). The branches also provide high quality habitat for a range of fauna species, as well as providing corridor connectivity throughout the landscape.

A steep elongated foothill is present in the far eastern boundary of the ML. This area is somewhat different to other areas in the ML, in that it has little to no canopy vegetation, very sparse *Triodia molesta* (pincushion spinifex) groundcover, and provides a number of smaller rocky caves. The later feature may increase the habitat quality of this area by providing shelter resources for small terrestrial fauna. Associated with these steeper foothill, is a number of higher slope gullies running towards the central portions of the ML. These gullies have a very rocky surface, and are dominated by dense clumps of *Triodia molesta* (pincushion spinifex) and/or *Acacia chisholmii* (Chisholm's wattle). The combination of rock piles and crevices, and dense vegetation cover, provide high quality habitat for smaller terrestrial fauna (e.g. mammals, amphibians and reptiles).

A single higher knoll is evident in the north-eastern corner of the ML. This area is dominated by a moderate *Triodia molesta* (pincushion spinifex) groundcover, and occasional steeper escarpments containing small rocky crevices and piles which provide shelter habitat for a number of smaller terrestrial fauna species. Surrounding this higher knoll is slightly undulating hills similar to the majority of the ML; however there is a noticeable lack of *Triodia molesta* (pincushion spinifex) and dominance of grass species.

3.7 Victoria

Victoria is a single Mining Lease Area of 33 ha.

3.7.1 Vegetation and Regional Ecosystems

Eucalyptus leucophloia (snappy gum) woodland is the dominant vegetation type over most of the site, with associated *Eucalyptus normantonensis* (Normanton box) and *Corymbia aspera* (rough-leaved ghost gum). *Eucalyptus normantonensis* (Normanton box) becomes the dominant tree species within the drainage lines across the site. A shrub layer of extremely sparse density is dominated by *Acacia chisholmii* (Chisholm's wattle) and *Acacia acridenia* (no common name) with associated *Acacia orthocarpa*, *Senna glutinosa* subsp. *pruinosa* (silver cassia) and juveniles of the dominant tree species. The dense ground layer is dominated by *Triodia molesta* (pincushion spinifex).

Two analogous regional ecosystems, (**Figure 13**) are present in the Victoria ML; both are *Eucalyptus leucophloia* (snappy gum) woodland RE functionally separated on the basis of geology (Land Zones); RE1.11.2 on hills and upper slopes of strongly folded metamorphic pre-Cambrian rocks; and RE1.12.1 on skeletal soils and some shallow red earths on stony hills and rises on igneous rocks.

The composition of the dominant species in each RE across the Victoria ML is described below.

RE 1.11.2 - *Eucalyptus leucophloia* (snappy gum) low open woodland

Description

This RE comprises the southern third of the Victoria ML (**Figure 13**). This community typically occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths.

Structure

The canopy layer (2-6m) is sparse in density and dominated by *Eucalyptus leucophloia* (snappy gum) with associated *Eucalyptus normantonensis* (Normanton box) and *Corymbia aspera* (rough-leaved ghost gum). The shrub layer (0.5-2m) is extremely sparse and is dominated by *Acacia chisholmii* (Chisholm's wattle) and juveniles of the dominant tree species with associated *Acacia acradenia*, *Acacia orthocarpa* and *Senna glutinosa* subsp. *pruinosa* (silver cassia). The ground layer (0-0.5m) is of a medium density and is dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

RE1.11.2 has a management status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.11.2, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.11.2 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

RE 1.12.1 - *Eucalyptus leucophloia* (snappy gum) low open-woodland on granites.

Description

This RE occurs across the northern two-thirds of the Victoria ML (**Figure 13**). This community typically occurs on ranges and stony hills and rises on igneous rocks, skeletal soils and some shallow red earths.

Structure

The canopy layer (1-5m) is extremely sparse and dominated by *Eucalyptus leucophloia* (snappy gum) with *Eucalyptus normantonensis* becoming dominant within the drainage lines. The shrub layer (0.5-1m) is sparse and dominated by *Acacia chisholmii* (Chisholm's wattle) and *Acacia acradenia* with associated *Acacia orthocarpa*. The ground layer (0-0.5m) is medium to dense and dominated by *Triodia molesta* (pincushion spinifex).

Species of Conservation Significance

With reference to Queensland's NC Act and the Commonwealth's EPBC Act, a number of threatened species are known to occur in the area. While the survey methodology did not allow for targeted searches, it is considered that potential habitat exists for a variety of threatened species. More detailed survey would be required to assess the presence or absence of threatened species within this community, and a post-wet season survey would be necessary to enable the detection of certain groups such as twiners, graminoids, sedges, forbs and sub-shrubs.

Weeds

No declared weed species occur in this community.

Status

RE1.12.1 has a management Status of *Least Concern* and a biodiversity status of *No Concern at Present*. This RE has no equivalency with threatened ecological communities listed under the EPBC Act.

Notes

Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks with skeletal soils and red earths.

Typically RE1.12.1, as do many of the REs in the tropical monsoon savannahs naturally burn between the storm season and the early dry season. Natural burning interval is usually 4-10 years, however mosaics of longer unburnt areas contribute to overall biodiversity.

The RE1.12.1 burn strategy should comprise large landscape scale burns with some patches burnt every 4-10, but also ensuring some patches are long unburnt (10-20 years). Annual burnt areas should be less than 30% (Queensland Herbarium, 2009).

3.7.1.1 Summary of Effects

No potential environmental constraints were identified within the Victoria ML. It is considered that no flora species, communities or ecosystems listed as significant under the NC Act, VM Act or EPBC Act will be adversely affected by any proposed development or activities within the Victoria ML.

3.7.1.2 Recommendations

It is highly recommended that additional, smaller-scale, surveys are carried out prior to any further development within the Victoria ML. A more thorough, detailed vegetation survey will definitively ascertain the presence/absence of species of conservation significance. A post-wet season flora survey will also need to be carried out across all of the MLs, to ascertain the presence/absence of those flora species not readily detectable during the dry season (herbs, forbs etc).

In the event any species or communities of conservation significance are detected, appropriate measures must be taken to ensure the protection and recovery of these species or communities.

3.7.2 Fauna and Habitats

A detailed description of all habitat types and their interaction with the landscape and potential to support faunal communities for the Victoria ML has been defined.

3.7.2.1 Habitats

The Victoria Mining Lease Area (ML) has been subject to previous mining activities. These activities have been focused in the northern and southern portions of the ML. Mineral extraction in the extreme north of the site is evident from a large rectangular pit occurring, which currently holds rain water (note: water quality has been shown to be high). The extraction pit currently has vertical slopes with exposed metamorphic rock with little to no vegetation cover. A number of vehicular access tracks and haulage roads occur throughout the majority of the site, connecting the extraction pit to the large rock/tailings dumps in the southern portions of the site. The site's disturbance areas are accessed from both the north and south by two main Access Roads which join the main Access Road to the west outside of the ML. The majority of the disturbance is localised and focused on the extraction pit, access trails and the rock/tailings pile.

The central portions of the ML consist of two small knolls which have exposed rocky outcrops which a number of crevices and small caves which provide a high quality habitat for a number of terrestrial species. These areas of exposed metamorphic rock are surrounded by moderately sloping foot hills with a dense *Triodia molesta* (pincushion spinifex) ground cover with a sporadic/spare *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle) canopy. Large plain areas occur in the ML's east, consistent with broader basin areas of the range. These areas are generally dominated by dense *Triodia molesta* (pincushion spinifex) and sparse to moderate canopy species which is usually dominated by *Eucalyptus leucophloia* (snappy gum) and *Acacia chisholmii* (Chisholm's wattle).

A number of ephemeral drainage lines occur throughout the site flowing from West to East. Most notably two drainage lines which flow through areas subject to disturbance. The northern most of the drainage lines has currently broken a previously constructed weir/dam wall and now drains directly into the extraction pit. This drainage line supports substantial vegetation and potential habitat for fauna.

The current state of the this habitat area would benefit flora and fauna alike should it be retained in its current condition, due to the pits depth which enables the retention of permanent water in the arid environment (thus providing habitat for a significant amount of fauna species). The central drainage line traverse the southern areas of the aforementioned metamorphic knolls and the adjacent to the to the southern disturbance areas. This drainage line currently supports a moderate canopy cover which consists for the most part of *Eucalyptus leucophloia* (snappy gum).

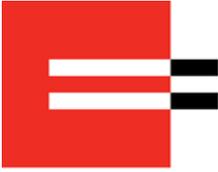
This drainage lines includes areas of rocky incised banks providing habitat for terrestrial species similar to that of the knoll areas. This area also provides a good foraging resource for species in persisting within the knoll areas given its proximity and canopy cover. This drainage line is bisected by a north/south access road where it becomes a large overland

drainage path consistent with a broader alluvial riparian area with small banks and a wide drainage area.

The southern disturbance area is relatively large in proportion to the ML. The eastern portions of this disturbance have a large steep disused rock dump which has been subject to significant native regeneration and is continuing to recruit vegetative cover. This regeneration will in time provide a good native ecosystem and avoid to the loss of soils. The western portions of this disturbance remain for the most part void of vegetation and appear to be subject to minor recent works.

Note: the presence of the permanent / semi permanent water source may result in the densities of fauna in ML/locality becoming higher than that of the natural carrying capacity, thus removing the modification of this habitat could potentially result in the loss of individual/species/faunal community's dependant on this modification.

Appendix B Gaps Analysis



PLACE

PLANNING
DESIGN
ENVIRONMENT

4 August 2010

ICM01_Gaps Analysis Advice Letter

Ivanhoe Cloncurry Mines Pty Ltd
PO Box 7476
St Kilda Rd
Melbourne, Victoria 3004
Attn: Rod Coe

Dear Rod,

IVANHOE ECOLOGICAL REPORT REVIEW

This report identifies the nature and extent to which a collated pool of existing literature assists in addressing environmental conditions imposed on Ivanhoe Cloncurry Mines (ICM) for the Selwyn Mine Area (SMA) by the Department of Environment and Resource Management (DERM). The purpose of this assessment is to identify the overall adequacy of the existing reports in attending to the requirements laid out in the conditions.

This review includes all available data relating to the environmental values of the SMA, as well as any documents based on relevant ecological studies in the surrounding area. A full list of all reviewed documents is provided in **Attachment A**. Reports detailing the results of surveys conducted within the SMA were compared to DERM's recommended survey methodology for Environmental Impact Statements (**Attachment B**) to assess the applicability of the results in contributing to the appropriate condition responses. These guidelines were originally prepared for Environmental Impact Assessments in Queensland's Wet Tropics Bioregion, and are therefore not ideal for ecological surveys in the rangelands. Notwithstanding, the broad principles of systematic, quantitative and appropriately timed survey techniques apply and provide the benchmark used in this review.

Site Description

The SMA is situated in the Selwyn Ranges, approximately 140km south-east of Mt Isa, Queensland. The Mine Area comprises 20 mining leases, spread over seven sites – Mt Elliott, Lady Ella, Mt Dore, Marilyn/Starra, Merlin, Mt Cobalt and Victoria, covering an area of approximately 4,740 ha.

General Findings

Selwyn Mine Reports

Two ecological studies have been conducted within the Selwyn Mine Area. These consist of broad-scale flora and fauna surveys at Lady Ella Mine in 2002 (AARC, 2002) and Merlin Mine in 2009 (AXM, 2009). The former utilized adequate field survey methodology but inappropriate timing (late May). The latter comprised a desktop analysis, opportunistic observations and field habitat assessment only (performed in late October). Owing to climatic variation between the dry and wet seasons, it is preferable to perform field

surveys immediately post-wet season (March-April) to ensure the detection of as many flora and fauna species as possible.

Further details of these reports are provided in **Attachment C**.

Surrounding Locality Reports

A moderate amount of information exists on the flora and fauna of the surrounding locality. The geology, geomorphology and vegetation patterning of the Selwyn District have been described by Wilford (2003). AARC (2008) provided an overview of the flora and fauna of the Cannington Project, which lies approximately 50km to the south-east of the Selwyn Mine Area. PLACE (2006) described the ecosystems, flora and fauna species of conservation significance likely to occur within the Trekelano Mine, approximately 50km to the west of the SMA.

Fanning (1993) described the fauna and fauna habitat present within the Osborne Project Area approximately 25km to the south-west of the SMA. PLACE (2008, 2010) also described the ecosystems, existing flora and fauna and species of conservation significance likely to occur within the Lucky Luke Satellite Operation of the Osborne Mine, approximately 10-20 kilometres from the southern end of the SMA. A targeted species-specific survey has also been conducted at Cloncurry Copper Project, approximately 80km north of the SMA.

Owing to the contiguous nature of the vegetation communities and fauna habitat within the locality, these results can be utilized to provide a comprehensive overview of the flora and fauna *likely* to occur within the Selwyn Mine Area. These resources are the result of a collaborative, comprehensive search, of all publicly available documents, by PLACE, Monash University and the State Library of Queensland.

Further details of the reviewed reports are provided in **Attachment C**.

Fauna Species of Conservation Significance

Database searches¹ and reviews of reports² have identified a number of species of conservation significance (SOCS) comprised of threatened species (17) listed in Commonwealth and State legislation, significant species considered migratory under Commonwealth legislation or which are species having restricted distribution and/or are at the limit of their known range which considered may, or are likely to occur in SMA. The threatened, significant and migratory species are referred to collectively herein as species of conservation significance (SOCS).

Threatened species were assessed in terms of their potential likelihood to utilise the study area, based on our understanding of the vegetation community and habitat types present, extrapolated from the previous surveys at Lady Ella and the Merlin leases (refer above). Three species which have already been recorded within the Selwyn Mine area by previous studies include:

- Kalkadoon grasswren;
- Carpentarian false antechinus; and
- Purple-necked rock wallaby.

1.: Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA), Protected Matters Search Tool and the Queensland Department of Environment and Resource Management's (DERMs) WildNet Database.

2.: see above listing and refer to **Appendix A**

A further four threatened species considered highly likely to occur comprise:

- Grey falcon;
- Common death adder;
- Pictorella manikin; and
- Square-tailed kite.

A further ten threatened or significant species have been recorded at sites in proximity to the SMA are considered important target species with habitat potentially present:

- Black-footed rock-wallaby;
- Troughton's sheath-tail bat;
- Collett's snake;
- Black-necked stork;
- White breasted sea eagle;
- Painted honeyeater;
- Black-chinned honeyeater;
- Night parrot
- Julia Creek dunnart; and
- Ghost bat.

The night parrot is another species which could be considered to have habitat present in the SMA, as parts of its former range overlay the site. The species is considered endangered within Queensland and is only very occasionally reported (by anecdotal means) from parts of its former range.

Insufficient information exists on the majority of the SMA to determine the presence or absence of suitable habitat for these species within the individual mining leases.

Flora of Conservation Significance

No flora species of conservation significance (SOCS), being threatened species listed in Commonwealth and State legislation or which are species having restricted distribution and/or are at the limit of their known range were recorded in proximity to the SMA by past vegetation surveys.

Database searches³ and reviews of reports⁴ have identified seven species considered potentially present in the broader locality which could be present in the SMA:

- *Acacia peuce*;
- *Brachychiton collinus*;
- *Cajanus lanuginosus*;
- *Goodenia angustifolia*;
- *Ptilotus psuedohelipteroides*;
- *Ptilotus remotiflorus*; and
- *Sclerolaena walker*.

Whilst the higher order trees and shrubs may be prominent within the landscape and therefore easily identifiable, some of the lower order (smaller forbs, twinners and graminoides) may only be prominent post good wet season rains. Therefore whilst the absence of *Acacia peuce*, *Brachychiton collinus* and *Cajanus*

3.: DEWHAs, Protected Matters Search Tool and DERMs WildNet Database.

4.: see above listing and refer to **Appendix A**

lanuginosus in the records from Lady Ella and Merlin may be truly indicative of their absence, the smaller species being those likely to be more prominent at the end of the wet season, *could* be present especially given past surveys were not conducted in optimal conditions.

No information exists to confirm their presence in the other leases.

Vegetation and Ecological Communities of Significance

Vegetation assessments at Lady Ella and Merlin leases have identified the presence of two Regional Ecosystems (REs) with the lowest level of management (under the *Vegetation Management Act*) and biodiversity (under DERMs Biodiversity assessment framework) status.

Reviews of reports⁵ have identified five REs of significance which are present in the locality which could be present in the SMA:

- RE1.3.4 which has a biodiversity status of *Of Concern*;
- RE1.3.6 which has a biodiversity status of *Of Concern*;
- RE1.3.7 which has a biodiversity status of *Endangered*;
- RE1.5.4 which has a biodiversity status of *Of Concern*; and
- RE1.5.6 which has a biodiversity status of *Of Concern*;

No ecological communities of national significance for the area were identified in the data consulted.

Approval Conditions

Each of the conditions are listed in **Table 1**, along with the details of any relevant literature relating to the Selwyn Mine and/or the surrounding area and an assessment of the adequacy of the information contained therein in addressing each condition. A brief description of any survey work or further information required to adequately fulfil the obligations imposed by each condition is also provided.

Appropriately collected data available on the existing ecological values of the Selwyn Mine Area are currently limited to the Lady Ella site. Therefore, in order to satisfy the DERM conditions, it is considered that additional assessment is required for every lease within the SMA except for Lady Ella. The data within the reports from the surrounding locality, and the information in the DERM and DEWHA databases, can be used to develop efficacious sampling techniques specific to the area and the range of species to be targeted.

5.: see above listing and refer to **Appendix A**

TABLE 1: DERM CONDITIONS

Condition	Related Literature / Research Sources	Assessment
<p>G1. The nature conservation values of all previously undisturbed areas less than 10 ha in area must be assessed through the internal permit system as described in Section 3.1.4 of the EMOS prior to disturbance by mining activities.</p>	<ul style="list-style-type: none"> ➤ July 2002, Lady Ella Flora and Fauna Report. Prepared by Australasian Resource Consultants Pty LTD for Selwyn Mines Pty LTD. ➤ 15 December 2009, Flora and Fauna Assessment of Merlin Dewatering Dam Site, Selwyn Mine, Qld. Prepared by AXM Environmental for Ivanhoe Cloncurry Mines. 	<p>Previous surveys recorded the conservation values of the Lady Ella (ML 90,061) and part of the Merlin (ML 2,746 and the southern half of 2,733) Sites prior to disturbance. Conservation values specific to MLs 2,732, 2,734 - 2,738, 2,745, 2,688 – 2,694, 2,566, 90,043 and the northern half of 2,733 have yet to be surveyed.</p> <p>Opportunities and Recommendations There is currently insufficient data to provide a comprehensive assessment of existing conservation values within the aforementioned MLs. It is considered that site specific field assessment would be required to further define and address this condition.</p>
<p>G2. The nature conservation values of all previously undisturbed areas greater than 10ha in area must be assessed prior to disturbance by mining activities.</p>	<ul style="list-style-type: none"> ➤ July 2002, Lady Ella Flora and Fauna Report. Prepared by Australasian Resource Consultants Pty LTD for Selwyn Mines Pty LTD. ➤ 15 December 2009, Flora and Fauna Assessment of Merlin Dewatering Dam Site, Selwyn Mine, Qld. Prepared by AXM Environmental for Ivanhoe Cloncurry Mines. 	<p>Previous surveys recorded the conservation values of the Lady Ella (ML 90,061) and part of the Merlin (ML 2,746 and the southern half of 2,733) Sites prior to disturbance. Conservation values specific to MLs 2,732, 2,734 - 2,738, 2,745, 2,688 – 2,694, 2,566, 90,043 and the northern half of 2,733 have yet to be surveyed.</p> <p>Opportunities and Recommendations There is currently insufficient data to provide a comprehensive assessment of existing conservation values within the aforementioned MLs. It is considered that site specific field assessment would be required to further define and address this condition.</p>
<p>G3. Strategies to alleviate the immediate impact on nature conservation values identified through pre-mining assessments must be reported in the Plan of Operations</p>	<p>Selwyn Reports: July 2002, Lady Ella Flora and Fauna Report. Prepared by Australasian Resource Consultants Pty LTD for Selwyn Mines Pty LTD.</p>	<p>AARC (2002) and AXM (2009) include recommended amelioration measures for the works proposed for the Lady Ella and Merlin sites. Amelioration strategies will need to be incorporated as part of the ecological assessments prepared for the remaining sites within the Selwyn Mine (Mt Elliott, Mt Dore, Starra, Mt Cobalt and Victoria), and included in the Plan of Operations prior to the commencement of any proposed disturbance.</p>
	<p>15 December 2009, Flora and Fauna Assessment of Merlin Dewatering Dam Site, Selwyn Mine, Qld. Prepared by AXM Environmental for Ivanhoe Cloncurry Mines.</p>	<p>A number of reports have been prepared on the conservation values of other sites in the surrounding area. Owing to the proximity of these studies to the Selwyn Mine, and the contiguous nature of the vegetation communities and fauna habitat within the locality, it is reasonable to expect a high degree of</p>

	<p>Reports from the Surrounding Locality:</p> <p>Fanning, D C (1993) "Fauna Survey of the Osborne Project area" Unpublished Report to Placer Pacific Pty. Ltd</p> <p>May 2006, 'Flora and Fauna Study between the Trekelano Leases and the Duchess to Phosphate Hill Road'. Prepared by PLACE Environmental for Placer Dome Australia.</p> <p>May 2008, 'Lucky Luke Satellite Operation – Flora and Fauna Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.</p> <p>June 2010, 'Lucky Luke Satellite Operation – Ecological Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.</p>	<p>similarity between the conservation values of these sites and those present within the Selwyn Mine sites. These data, and the results of the latest database searches, can contribute to the compilation of a comprehensive list of potential conservation values at risk of impact from proposed mining activities.</p> <p>Opportunities and Recommendations</p> <p>It is recommended that a rapid assessment of habitats and vegetation communities be undertaken for each of the sites not yet adequately surveyed (Mt Elliott, Mt Dore, Starra, Mt Cobalt, Merlin and Victoria) to ascertain the specific habitat values present at each site. This information, in conjunction with species and communities known to occur, or considered likely to occur, remote sensing analysis (aerial photograph and satellite imagery), and basic risk analysis can be used to develop strategies for the alleviation of negative impacts (response plan, management plan, clearing protocols plan) as a result of proposed mining activities.</p>
	<p>Databases</p> <ul style="list-style-type: none"> ➤ EPBC Protected Matters Accessed 21 June 2010 ➤ EPA Wildlife Online Accessed 21 June 2010 	
<p>G4. Protection and recovery plans must be developed for any identified endangered or threatened ecological communities or species and must include measurable targets for protection</p>	<p>As per G3.</p> <p>plus:</p> <ul style="list-style-type: none"> ➤ 2004-2008 National Multi-species Recovery Plan for the Carpentarian 	<p>Database searches and previous studies within the Selwyn Mine sites and the surrounding locality have identified a number of species of conservation significance known to occur or with the potential to occur in the leases.</p> <p>Opportunities and Recommendations</p> <p>Owing to the lack of site-specific data for the aforementioned sites, it is</p>

<p>and recovery of those communities/species.</p>	<p>Antechinus <i>Pseudantechinus mimulus</i>, Butler's Dunnart <i>Sminthopsis butleri</i>, and Northern Hopping-mouse <i>Notomys aquilo</i>. Natural Heritage Trust, Canberra.</p> <p>➤ April 2009, 'Cloncurry Copper Project – Purple-necked Wallaby Survey'. Prepared by AARC for Exco Resources Ltd.</p>	<p>considered that rapid targeted surveys within any suitable habitat at each of the SMA Leases are necessary to ascertain the presence or absence of any species of conservation significance. Protection and recovery plan may then be prepared for each SOCS recorded on-site.</p>
<p>G5. The area disturbed for mining and not rehabilitated within 12 months must be kept to a minimum and be specified in each Plan of Operations.</p>	<p>n/a</p>	<p>A Mine Rehabilitation Plan is necessary to be able to address this condition in the Plan of Operations.</p> <p>Opportunities and Recommendations Details of the proposed mining activities.</p>
<p>G6. A Weed Management Plan must be developed for the project and be presented in the relevant Plan of Operations.</p>	<p>As per G3.</p> <p>plus:</p> <p>➤ The impacts of invasive plant species on the biodiversity of Australian rangelands Grice, A. C. The Rangeland Journal 2006, 28(1) 27–35</p>	<p>No declared weed species have been identified within the Lady Ella or Merlin sites.</p> <p>Opportunities and Recommendations Owing to the lack of site-specific data for the Mt Elliott, Mt Dore, Starra, Mt Cobalt, Merlin and Victoria sites, it is considered that assessment during rapid SOCS searches and incidental observations will ascertain the presence or absence of declared weed species and confirm the necessity, or otherwise, of a Weed Management Plan.</p>

Suggested Approach to Address Information Gaps

The approach suggested to address the information gaps identified by this assessment, and thus allow Ivanhoe to complete its Environmental Management Plan before January 2011, is outlined.

A basic determination of general habitat types present for the SOCS and vegetation communities in each lease could be gleaned from an analysis of aerial photography and satellite imagery using habitat data from the Lady Ella and Merlin sites as a guide, and field validated by rapid ground-truthing. In the field rapid field assessments of each lease (foot or vehicle traverses) could be undertaken to confirm habitats and/or species presence and thus allow validation of the presence or absence of SOCS or habitat.

From this preliminary work a basic risk assessment (constraints and opportunities analysis) could be prepared for each lease to identify significant vegetation community presence (or likely presence) and SOCS habitats of high, moderate and low constraint to future mining operations. Areas of perceived higher constraint might be subjected to stricter mining activity controls and/or further, detailed studies depending upon the nature of the disturbance proposed (eg. exploration, development of linear corridors, underground versus above ground mining operations) the habit and mobility of targeted SOCS (eg. whether sedentary or wide ranging species) and SOCS habitat significance (eg. critical habitat roosts, core habitat, marginal habitat).

Such a strategy would be cost effective, timely in respect of ICMs timing constraints and facilitate the development of preliminary mapping of conservation constraints.

Based on this specific Disturbance Protocols, Habitat and SOCS Clearing Protocols, SOCS and Significant Vegetation Community Management Plans and Plans of Operation can be further developed.

Conclusion

PLACE have ascertained that the quality and range of document sources in their current form would provide for a partial address of multiple environmental conditions placed on ICM by the Department of Environment and Resource Management.

In order to adequately address these environmental conditions, further information on the ecological values of the SMA Leases is required. Information relevant to the environmental conditions can be collected, at least initially through a rapid targeted assessment of site values aimed at confirming and mapping the presence and extent of habitats for threatened and significant flora, fauna and vegetation communities.

This approach will provide timely, cost effective data allowing ICM to finalise its Environmental Management Plan.

Yours faithfully,

PLACE Design Group



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Associate – Environment Manager

ATTACHMENT A

References

REFERENCES

AARC (2002), 'Lady Ella Flora and Fauna Report'. Prepared by Australasian Resource Consultants Pty LTD (AARC) for Selwyn Mines Pty LTD.

AARC (2008), 'Cannington Life Extension – Initial Advice Statement'. Prepared by AARC for BHP Biliton Minerals Pty Ltd.

AARC (2009), 'Cloncurry Copper Project – Purple-necked Wallaby Survey'. Prepared by AARC for Exco Resources Ltd.

AXM (2009), 'Flora and Fauna Assessment of Merlin Dewatering Dam Site, Selwyn Mine, Qld'. Prepared by AXM Environmental for Ivanhoe Cloncurry Mines.

Department of Environment and Resource Management, Queensland Parks and Wildlife Service (2010), "Wildlife Online Extract" Accessed at http://www.derm.qld.gov.au/wildlife-ecosystems/wildlife/wildlife_online/ 21 June 2010.

Department of Environment, Water Heritage and the Arts (2010) "EPCB Act Protected Matters Report" Accessed at <http://www.environment.gov.au/erin/ert/epbc/index.html> 21 June 2010.

Elsol, J. (1994) 'BHP Minerals Cannington Project Vegetation and Flora Survey'. John Miedecke and Partners Pty Ltd.

Fanning, D C (1993), 'Fauna Survey of the Osborne Project area'. Unpublished Report to Placer Pacific Pty. Ltd.

Grice, A. C (2006), 'The impacts of invasive plant species on the biodiversity of Australian rangelands', *The Rangeland Journal* 2006, 28(1) 27–35.

PLACE (2006), 'Flora and Fauna Study between the Trekelano Leases and the Duchess to Phosphate Hill Road'. Prepared by PLACE Environmental for Placer Dome Australia.

PLACE (2008), 'Lucky Luke Satellite Operation – Flora and Fauna Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.

PLACE (2010), 'Lucky Luke Satellite Operation – Ecological Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.

QLD Government, State Development (2002), 'Selwyn Mines Expansion Project, Terms of Reference for an Environmental Impact Statement'. Selwyn Mines Limited.

SRK (2010), 'Independent Technical Report on the Merlin Project Queensland'. Prepared by SRK Consulting for Ivanhoe Australia Ltd.

Wilford, J.R (2003), 'Selwyn District, Queensland', CRC LEME, Canberra.

ATTACHMENT B

DERM's Recommended Fauna Survey Methodology for Environmental Impact Assessments

Recommended Fauna Survey methodology for Environmental Impact Assessments

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1.0 Fauna Survey Overview (Terrestrial and Aquatic)

Sampling sites should be selected to reflect the complexity of the landscape and represent all major faunal habitat types. Habitat means the broad landscape/ecosystem type such as riparian, rainforest, grassland, open forest etc. There can be two or more very different faunal habitat types within one vegetation/regional ecosystem type. For example, an open forest might have areas of grassy ground stratum with lots of fallen logs and litter; grassy ground stratum with no fallen logs and not much litter; areas of shrubby mid-stratum; and an area of rock outcrop. These represent four very different faunal habitat types.

The survey should aim for at least 10 primary or systematic sites (use of all main survey techniques) with a minimum of two primary sites per major habitat, broad vegetation group or vegetation community (whichever appropriate). In addition to the primary sites it is expected that there will be secondary sites/opportunistic records – use of targeted techniques away from primary sites in small habitat areas e.g. rock outcrops, ephemeral water bodies.

Terrestrial fauna (mammals, birds, bats etc.) should be surveyed using appropriate sampling techniques, such as trapping, spotlighting, recording of calls and general field observations. Fauna survey equipment and techniques should include Elliott traps, wire cage traps, drift fences with pitfall traps and incorporating funnel traps, ultrasonic detection, call playback, harp traps, and intensive diurnal and nocturnal searches should also be implemented to ensure that vertebrates are effectively sampled.

Birds will be sampled using the Birds Australia Atlas methodology for a 2ha site (<http://www.birdsaustralia.com.au/our-projects/atlas-birddata.html>). As a minimum each of the primary sites will be sampled in this way. Birds will be sampled at least three times in the year (during the Wet, Dry and Storm seasons) to adequately 'capture' the full range of species at each of the primary sites.

Aquatic habitats will be sampled for fish and turtles through the use of dip nets, turtle traps and electrofishing. Boat based spotlight surveys will be used to sample the crocodile density and distribution.

Vertebrates generally will be sampled three times during a 12 month survey period (wet season, dry season and storm season) for no less a period than 3 sampling days and nights at each site. Where identification of specific fauna is uncertain a voucher specimen will be collected and lodged in the Queensland Museum for confirmation of the identification. This will be carried under an appropriate ethics approval.

Sampling techniques should be confirmed with the EPA prior to surveys. The following table provides guidance:

Technique ¹	Mammals	Birds	Reptiles	Amphibians	Fish
Calls including call playback	X	√	X	√	X
Incidental Collection/Observation	√	√	√	√	√
Pitfall Traps & drift fences & funnel traps	√	X	√	√	X
Elliott Traps	√	X	√	X	X
Cage Traps	√	X	X	X	X
Spotlighting	√	√	√	√	X
Daytime Walk Transects, Log turning etc.	√	X	√	√	X
2 ha Site using Birds Australia Atlas Methodology	X	√	X	X	X
Harp Traps and Mist nets	√ (bats)	X	X	X	X
Scat and bird pellet analysis (species identification and/or prey/food determination)	√	√ (prey/food determination only)	√	X	X
Hair tubes	√	X	X	X	X
Ultrasonic Detection	√ (bats)	X	X	X	X
Turtle Traps	X	X	√	X	√
Dip Nets and Electrofishing	X	X	X	X	√

It is expected that those consultants making the assessment will, as a matter of course, make use of museum specimen data, Birds Australia Atlas data and other available data sets for the area to further improve any assessment made.

2.0 Specific Survey Methodology

2.0.1 Primary Terrestrial Sites

Each of the primary sites will contain:

At least two sampling sites each sampling site will have the following in a 50m x50m quadrat:

- 2 Pitfall traps
- 4 Funnel traps
- 20 Elliot traps
- 4 cage traps

Trapping should take place for no less than three nights and days preferably at least five.

The sampling site will be the basis for the 2ha bird survey which will be carried out in the early morning, with each sampling site being surveyed for birds at least three times during each field trip.

2.0.2 Secondary Terrestrial sites

Secondary sites will be used to sample specific fauna groups or habitats which do not occur within the primary sites. For example, in order to adequately sample bats specific bat flight paths should be sampled such as streams and tracks. Additional searches should also be carried out for species of conservation significance that could occur in the area but have not been recorded in sample sites. The extent of such searches should be consistent with the known habitat and occurrence of the target species

2.0.3 Reporting and Discussion

Provide full details of each site surveyed (habitat description) with co-ordinates (including datum) and list of methods used at site.

Provide a list of all species recorded at each site including method of detection and relative abundance (plus any specific comments, e.g. evidence of breeding). All opportunistic records should have species name, co-ordinates, habitat and abundance information.

The fauna habitat within the assessment area should be described and mapped at an appropriate scale (e.g. 1:10,000) based on aerial photographs and ground survey. The following information should be provided:

- location and extent of vegetation types using the EPA regional ecosystem descriptions (Detailed descriptions of regional ecosystems can be obtained through the EPA website: [REDD Version 5.1 - June 2007](#));
- location and extent of habitat types;
- location of sampling points or transects for each group of species;
- occurrence of species listed as *presumed extinct*, *endangered*, *vulnerable* or *rare* under the *Nature Conservation (Wildlife) Regulation 1994*;
- occurrence of species listed as *endangered* or *vulnerable* under the *Environmental Protection and Biodiversity Conservation Act 1999*;
- occurrence of any exotic fauna species;
- existing condition and impacting or threatening processes in relation to the habitats and species of significance.

A discussion should be given on the conservation status for each threatened species recorded (*Nature Conservation Act 1992* and *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*, international agreements such as JAMBA and CAMBA), its habitat and wildlife movement corridor requirements.

A discussion of the likelihood of occurrence of endangered and vulnerable species that might have been expected to occur there (given the habitat) but weren't found should be provided, including reasons why they may not have been found.

3.0 Aquatic fauna

Sampling sites should be selected to reflect each habitat type occurring in the assessment area such as:

- Instream pools/runs
- Instream riffles/rapids
- Offstream perennial pools (billabongs, ox-bow lakes etc)

The environmental characteristics of the riparian and instream zones are to be described at each site. Measurements should include, but not necessarily limited to, depth profiles, velocity profiles, condition of the riparian and littoral vegetation, particle size distributions of bed sediment and bed/bank condition.

Aquatic habitat sampling should reflect the ecosystem response to flow regime e.g. sample after a flow event and when habitat is limited to waterholes.

3.0.1 Aquatic Macro-invertebrates

The aquatic macroinvertebrate assemblages at each site should be sampled and described. Surveys should examine both the benthic and nekton macro-invertebrate components in each micro-habitat type (eg. stream edge, riffles etc.). The sampling procedure adopted should be standardized (as far as practical) to suit the characteristics of the site.

For each site, benthos and nekton are to be described in terms of faunal composition, abundance and diversity. Fauna should be identified to the most practical taxonomic level (eg. Family for insects, Order and Phyla for other taxa). Benthic data should be analysed using standard procedures used in bio-monitoring programs. A reference collection of specimens should be submitted to the Queensland Museum at the completion of the study.

3.0.1 Aquatic vertebrates

Fish

Fish should be sampled using a variety of sampling gear (gill, seine and dip nets, baited fish traps, trawl nets and electro-fishing) to ensure representative samples of fish species and size ranges present are obtained. Sampling procedures should be standardised with previous studies in the region to allow comparisons of the relative abundance of species. Past surveys may be available for some areas, contact the Queensland Department of Primary Industries and Fisheries (DPI&F) for advice on permits, survey methods and past surveys.

Existing knowledge should be used to document the movement patterns of each species sampled. Survey results should then be discussed in relation to fish passage requirements.

Freshwater turtles

The freshwater turtle fauna in this region is potentially rich and of much interest. They should be targeted using specialized turtle traps. Other techniques such as dip-netting from a boat at night may also be considered.

Surveys for freshwater turtles should occur in suitable habitat. At least 20 sites throughout the impacted area should be surveyed on as many of the major waterways that can practically be accessed. Each site should be sampled by no less than 15 traps for at least three nights and days. Distance between traps will be decided by access and logistics but ideally will be no less than 50m.

Estuarine Crocodiles

Spotlighting from boats should be used to ascertain crocodile densities within all suitable waterways of the area to be impacted by the development that can practically be assessed. In order

to ascertain the population structure all crocodiles observed should be classified according to size with surveys to take place during low tides when crocodiles are likely to be exposed.

A systematic assessment of sub saline wetlands for potential crocodile breeding sites shall also be made where practical.

3.0.2 Reporting and Discussion

Significant aquatic habitat should be described. An aquatic habitat map at an appropriate scale (ie. 1:10 000) should be produced based on aerial photographs and satellite imagery supported by ground survey. The following information should be provided:

- location of significant geomorphological stream features (including major bars, ox-bow lakes etc.);
- location of significant stream habitat features (aquatic macrophytes, large 'snags' etc.); and
- existing impacting processes (i.e. irrigation extraction points, recreational activities and gravel extraction operations).
- location of sampling points;
- occurrence of species listed as *presumed extinct*, *endangered*, *vulnerable* or *rare* under the *Nature Conservation (Wildlife) Regulation 1994*;
- occurrence of species listed as *endangered* or *vulnerable* under the *Environmental Protection and Biodiversity Conservation Act 1999*;
- occurrence of any exotic fauna species;
- existing condition and impacting or threatening processes in relation to the habitats and species of significance.

A discussion should be given on the conservation status for each species recorded (*Nature Conservation Act 1992* and *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*), its habitat and movement requirements.

A discussion of the likelihood of occurrence of endangered and vulnerable species that might have been expected to occur there (given the habitat) but weren't found should be provided, including reasons why they may not have been found.

ATTACHMENT C

Literature Review

LITERATURE REVIEW

- **July 2002, Lady Ella Flora and Fauna Report. Prepared by Australasian Resource Consultants Pty LTD for Selwyn Mines Pty LTD.**

Aim:

To provide information regarding:

- Structure and composition of vegetation on site
- Species of fauna present on site
- Potential occurrences of flora and fauna species of local/state/national significance
- Mitigation and rehabilitation strategies

Methodology:

- Site Size – 20 ha
- Database Searches – EPBC, Herbreccs, Wildnet, Birds Australia Atlas, Qld Museum Fauna database.
- Flora – random meander transects
- Fauna – elliotts, anabat, spotlighting, diurnal birding, scat searches, active searches (reptiles), opportunistics, habitat assessment.
- Timing – late May. (autumn)

Results:

- Flora – one plant community present: *E. leucophloia* with *Triodia* spp. undestorey. (not significant)
 - Three Species Of Conservation Significance (SOCS) recorded in the surrounding locality, but all considered unlikely to occur on site:
 - *Cajanus lanuginosus* (rare, schedule 4 NCWR)
 - *Kohautia australiensis* (rare, schedule 4 NCWR)
 - *Brachychiton collinus* (rare, schedule 4 NCWR)
 - No declared weed species
 - Basic recommendations/mitigation measures (including measures for the prevention of weed invasion)
- Fauna – three SOCS found:
 - Black kite (migratory, EPBC)
 - Purple-necked rock wallaby (vulnerable, NCWR)
 - Carpentarian false antechinus (vulnerable, EPBC)
 - Five SOCS were found in the surrounding locality:
 - Black-shouldered kite (migratory)
 - Common death adder (rare)
 - Brown falcon (migratory)
 - Nankeen kestrel (migratory)
 - Grey falcon (rare)
 - Three SOCS were considered to potentially occur on-site:
 - Picrorella manikin (rare under the NCWR 1994)

- Night parrot (endangered under the NCWR 1994)
- Ghost bat (vulnerable under the NCWR 1994)
- Recommendations/mitigation measures suggested to minimise impact

- Comparison with DERM Guidelines:

Vegetation communities adequately sampled. Fauna survey techniques effectively targeted small mammals, bats, reptiles and birds. Results indicate opportunistic observations were adequate to identify large mammals present on site. Fauna habitat adequately assessed and described.

➤ **15 December 2009, Flora and Fauna Assessment of Merlin Dewatering Dam Site, Selwyn Mine, Qld. Prepared by AXM Environmental for Ivanhoe Cloncurry Mines**

Aim:

To conduct a broad baseline survey of flora and fauna that could be impacted by the construction of the dam at the Merlin site, Selwyn Mine.

Methodology:

- Site Size – 84 ha;
- Database Searches – VMA Mapping, EPBC, REDD, Herbreccs, Wildnet, Qld Museum Fauna database;
- Consultation – Herbarium, Selwyn Site Manager;
- Flora – representative surveys;
- Fauna – spotlighting, diurnal birding and active reptile searches, opportunistics, scat collection and analysis;
- Timing – late October;

Results:

Flora – site vegetation consists of Eucalyptus leucophloia low open-woodland. The database searches did not return any plant species listed as rare or threatened under State or Commonwealth legislation. The field surveys did not detect any rare or threatened plant species. The surveys of the dam site did not detect any significant populations of declared or environmental weeds.

Fauna - The potential dam area comprises remnant vegetation, which has been variously modified by cattle grazing, fire and mining exploration. The small range of fauna habitats includes:

- Ridge lines with exposed rock outcrops containing crevices, small caves and boulder piles;
- Colluvial slopes and fans with low open woodland and spinifex hummocks; and
- Ephemeral creek lines with associated low woodland trees, shrubs and spinifex hummocks.

The dominant tree species on the slopes and ridges are Snappy Gum, Cloncurry Box, Rough-leafed Ghost Gum with River Red Gum confined to the drainage lines. Most trees were small and less than 6 m tall and very few trees containing hollows were observed.

The EPBC Protected Matters database search returned one vulnerable bird species and seven migratory bird species that may occur or have preferred habitat that may occur in the study area. The search of the EPA's Wildlife Online database for the 400 km² centred on the proposed dam site

returned the Purple-necked Rock Wallaby (*Petrogale purpurecollis*). The mine manager's fauna database consisted of 79 bird species and 15 reptiles. The lists contains no rare or threatened fauna species.

Of the rare or threatened species identified in the desktop study, only the purple-necked rock wallaby was observed in the wider study area during the AXM survey.

Comparison with DERM Guidelines:

Database searches and habitat descriptions as per recommended methodology. No active trapping undertaken.

➤ **QLD Government, State Development, November 2002, Selwyn Mines Expansion Project, Terms of Reference for an Environmental Impact Statement. Selwyn Mines Limited.**

Aim:

To provide the required framework of an EIS for Selwyn Mines future operations.

Summary:

There are 20 granted Mining Leases (MLs) and three Mining Lease Applications (MLAs), which cover an area of 4,740 hectares (ha), associated with the present mining activities. The Commonwealth Minister for the Environment and Heritage has declared the Project to be a 'controlled action' under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC) because of the potential impact on a matter of 'national environmental significance'. The decision follows referral of the Project to the Commonwealth Department of the Environment and Heritage (Environment Australia) by the Company, citing the presence in the Project area of a small mammal, *Pseudantechinus mimulus*, which is listed as Vulnerable under the EPBC. As a result, the impact assessment provisions of the EPBC have been triggered by the Project.

Following the sale to Ivanhoe Mines and their intention not to proceed with the Selwyn Mines Expansion project as proposed, the EIS process under the State Development Public Works Organisation Act has now been terminated.

➤ **Wilford, J.R 2003, 'Selwyn District, Queensland', CRC LEME, Canberra.**

Summary:

Brief description of climate and dominant vegetation. In-depth discussion of geology and natural history of the area.

➤ **5 March 2010, 'Independent Technical Report on the Merlin Project Queensland'. Prepared by SRK Consulting for Ivanhoe Australia Ltd.**

Aim:

To provide an independent assessment of the Merlin mineral zone of the Mt Dore deposit.

Summary:

Environmental content limited to climate and physiographic descriptions.

➤ **May 2008, ‘Cannington Life Extension – Initial Advice Statement’. Prepared by AARC for BHP Biliton Minerals Pty Ltd.**

Aim:

To provide information on current and proposed operations and a description of the existing environment to support the application to lodge a voluntary EIS.

Summary:

Flora - Baseline flora surveys conducted in 1993 and 1994 determined the major vegetation communities on the current Project area comprised of five grassland types, several woodlands and scalded areas (Elsol J of John Miedcke and Partners, 1994). All vegetation types identified during the survey were considered widespread and common, and no rare or threatened plant species were identified. Due to changes in the vegetation classification system and sampling techniques since the initial baseline work, an additional flora survey will be undertaken for the expansion Project. This information will include Regional Ecosystem (RE) classification and mapping and will be presented in the EIS for the Project. (Data referenced from **Elsol, J. (1994)** BHP Minerals Cannington Project Vegetation and Flora Survey. John Miedcke and Partners Pty Ltd.)

- **Fauna** - Since the initial baseline survey performed in 1994, a number of other fauna surveys have been undertaken on the Project up to as recently as 2004. A summary of the findings from these surveys are as follows:
 - A total of 267 fauna species have been recorded on the Project site over the past ten years, comprising of 32 mammals, 9 amphibians, 62 reptiles, 155 birds, six fish and three crustaceans. Seven introduced species were identified of which the Dingo, Feral Cat, Feral Pig, Fox and Goat are listed as Class 2 pest under the Land Protection (Pest and Stock Route management) Act 2002;
 - No threatened species listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) have been recorded on the Project site;
 - A number of migratory and/or marine overfly species listed under the EPBC Act have been recorded on the Project site.
 - One Endangered species, listed under the Nature Conservation Act 1992 (NC Act) the Troughton’s Sheathtail Bat (*Taphozous troughtoni*) was identified on the Project site. Troughton’s Sheathtail Bat was known only from selected areas around the Cloncurry/Mount Isa region. This species is a cave-dweller, and is known to utilise disused mine shafts (Churchill 1998). It is also known to co-roost in some locations (Duncan et al 1999).
 - Seven Rare species, listed under the NC Act have been identified on the Project site. These included the Death Adder (*Acanthophis antarcticus*), Collett’s Snake (*Pseudechis colletti*), Grey Goshawk (*Accipiter novaehollandiae*), Square-tailed Kite (*Lophoictinia isura*), Pitorella Mannikin (*Heteromunia pectoralis*), Black-necked Stork (*Ephippiorhynchus asiaticus*), and Painted Honeyeater (*Grantiella picta*).

➤ **Fanning, D C (1993) “Fauna Survey of the Osborne Project area” Unpublished Report to Placer Pacific Pty. Ltd.**

Aim:

To provide information on the fauna and fauna habitats of the area and assess the potential impacts of the operation on the local fauna assemblage.

Methodology:

- Site – Osborne deposit and immediate vicinity;
- Literature review – topographic maps, aerial photos, reference books, published distributional information;
- Flora – vegetation assessment at each site;
- Fauna – Elliott traps, pitfalls, spotlighting, intensive habitat searches, opportunistics, signs; and
- Timing – 28th April – 6th May

Summary:

Flora – On the remnant plateaux and slopes down to the alluvial plains, Spinifex is the dominant ground cover with scattered eucalypts and areas of shrubland with Spinifex on the better soils. The alluvial plains and flats are characterised by a range of grasses and varying densities of shrubs and trees. These are more dense in and along the creeklines and gullies.

Fauna Habitat – delineated into Mesa Grassland, Slopes, Lowlands, Watercourses and Mitchell Grass Plains, description of specific characteristics provided.

Fauna - Overall, 91 native species recorded – 5 mammals, 61 birds, 13 reptiles and 4 amphibians. Two species of conservation significance were recorded on-site, namely the black-footed rock wallaby, which is classified as Vulnerable Australia-wide and the common death adder (Rare, NCA 1992). Four migratory species under the EPBC Act were also recorded on-site, the great egret, black kite, rainbow bee-eater and brown falcon. Seven species of conservation significance were considered to potentially occur on-site:

- Julia creek dunnart (Endangered, EPBC Act)
- Purple-necked rock wallaby (Vulnerable, NC Act)
- Ghost bat (Vulnerable, NC Act)
- Northern leaf-nosed bat (Vulnerable, NC Act)
- Square-tailed kite (Rare, EPBC Act)
- Grey falcon (Rare, NC Act)
- Black-throated finch (Vulnerable, NC Act)

The report provides an assessment of the potential impacts of the proposed development on present fauna populations and those considered likely to be present. Amelioration measures also detailed.

➤ **May 2006, 'Flora and Fauna Study between the Trekelano Leases and the Duchess to Phosphate Hill Road'. Prepared by PLACE Environmental for Placer Dome Australia.**

Aim:

To provide information on ecosystems, flora and fauna of conservation significance present or likely to occur within the study area.

Methodology:

- Database searches – EPBC, Wildnet, Qld Herbarium;
- Lit review – Fox (2006) "Report on Field Visit to Trekelano Mine Site", Environmental Protection Agency, Mt. Isa;
- Field Survey – Fauna habitat assessment, vegetation community assessment; and
- Timing – late March.

Summary:

- Flora:
Regional ecosystem mapping of the investigation area.

Regional Ecosystem	Vegetation Community
1.5.4x2	1 Low Open Woodland of <i>Acacia cambagei</i> (Gidyea)
1.5.4x2	1a. Low Open Woodland of <i>Acacia cambagei</i> (Gidyea) with predominantly of mature Gidyea within the canopy layer
1.5.4x2	1b. Low Open Woodland of <i>Acacia cambagei</i> (Gidyea) with predominantly Inland Bloodwood within the canopy layer
1.5.4x1b	2 Low Open Woodland of <i>Corymbia terminalis</i> (Inland Bloodwood)
	3 Tall Open Shrubland of <i>Acacia chisolmii</i> (Chisolm's Wattle)
1.5.4x1b	3a. Tall Open Shrubland of <i>Acacia chisolmii</i> (Chisolm's Wattle)
1.11.3x1	3b. Tall Open Shrubland of <i>Acacia chisolmii</i> (Chisolm's Wattle) on hills
1.5.4b	4 <i>Triodia longiceps</i> (Hard Spinifex) Grassland with emergent Inland Bloodwood
1.3.7c	5 Woodland of <i>Eucalyptus camaldulensis</i> (River Red Gum)
1.3.6x1b	6 Woodland of <i>Eucalyptus leucophylla</i> (Cloncurry Box) on narrow alluvial terraces
1.5.4x2	7 Open bare sand plains

- CWQ14a – RE 1.5.4, which is described as “Cloncurry Box (*Eucalyptus leucophylla*) low open woodland on red earths in valleys”. As of December 2005, This vegetation community had a *Vegetation Management Act 1999* conservation status of “Not of Concern” and an EPA biodiversity status as “Of Concern”.
- CWQ38a – RE 1.11.3, which is described as “Cloncurry Box (*Eucalyptus leucophylla*) low open woodland on basic rocky hills on folded sediments”. As of December 2005, This vegetation community had a *Vegetation Management Act 1999* conservation status of “Not of Concern” and an EPA biodiversity status as “No concern at present”.
- The Wildlife Online Database (EPA 2006) (**APPENDIX 3**) indicates records of the Rare (*Nature Conservation (Wildlife) Regulation, 1994*) *Cajanus lanuginosus* and *Brachychiton collinus* within the specified search area.
- There are also anecdotal records of the Rare *Goodenia angustifolia* in this locality (Fox 2006).

Targeted surveys for threatened flora species/ecological communities/regional ecosystems known or considered possible occurrences within the Study area and surrounds (including those listed in the Schedules of the Queensland Nature Conservation Act, 1992, Vegetation Management Act, 1999 and Commonwealth Environment Protection and Biodiversity Conservation Act, 1999) and mapping of the locations of any threatened flora species/ecological communities/regional ecosystems if identified.

- Fauna:

An assessment of potential habitat for threatened flora and fauna species in the Study area.

- 7 species considered to have a medium potential to occur:
 - Grey Falcon;
 - Black-chinned Honeyeater;
 - Purple-necked Rock-wallaby;
 - Ghost Bat;
 - Troughton's sheath-tail bat; and
 - Orange Horseshoe bat.
- Opportunistics – 1 amphibian, 2 reptiles, 43 birds and 3 mammals (one rare – purple-necked wallaby).

Comparison with DERM Guidelines:

Database searches and habitat descriptions as per recommended methodology. No active trapping undertaken.

➤ **May 2008, 'Lucky Luke Satellite Operation – Flora and Fauna Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.**

Aim: to provide information on ecosystems, flora and fauna of conservation significance present or likely to occur within the study area.

Methodology:

Study Area Size –

Database Searches – EPBC, Wildnet, Birds Australia, Essential Habitat Mapping, VMA RE Mapping, background literature.

Flora – Structural composition, canopy cover, canopy height range, common groundcover species and broader landform features, such as landform, slope, soils, geology, ground layer composition (i.e. proportion of litter, rocks, bare ground etc), disturbance and habitat quality, were recorded from a point location. The abundance of tree species was also measured as basal area. Structural composition was assessed within representative areas of EPA mapped remnant and non-remnant vegetation; wherein, the composition, canopy cover, canopy height range, site co-ordinates and terrain attributes of all strata were recorded; or, verification of Regional Ecosystem mapping and evidence of field traverse via the recording of the dominant species present, along with their abundance and median height and cover, and geographical position. A random meander was performed within all sites to assess the presence or likelihood of presence of rare and threatened flora species and communities and their habitats identified from database searches.

- Vegetation community and RE Mapping

- Targeted searches for threatened species and weeds.

Fauna – Habitat assessment

- Opportunistic observations

Timing – mid-May 2008

Summary:

Flora - Ten distinct vegetation communities (Regional Ecosystems) were identified within the Investigation Area. None of the Regional Ecosystems recorded are listed as Endangered Ecological Communities under Schedule 3 of the *Environment Protection and Biodiversity Conservation Act, 1999*, nor as Endangered Regional Ecosystems under the *Vegetation Management Act, 1999*. Four of the Regional Ecosystems have an Environment Protection Agency (EPA) biodiversity conservation status Of Concern and one Regional Ecosystem has an EPA biodiversity status of Endangered.

No flora species listed as Rare, Vulnerable or Endangered under the *Nature Conservation Act, 1992* were identified in the Investigation Area.

Habitat - Six threatened fauna species have been identified as having a medium likelihood of occurring in the Investigation Area or close surrounds. Five species are listed as Rare and one as Vulnerable under the *Nature Conservation Act, 1992*. These are:

- *Brachychiton collinus* – R;
- *Cajanus lanuginosus* – R;
- *Goodenia angustifolia* – R;
- *Ptilotus remotiflorus* – R;
- *Ptilotus psuedohelipteroides* – R; and
- *Sclerolaena walkerii* - V

Recommended mitigation measures discussed.

Comparison with DERM Guidelines:

Database searches and vegetation community / habitat descriptions as per recommended methodology. No active trapping undertaken.

➤ **June 2010, 'Lucky Luke Satellite Operation – Ecological Assessment'. Prepared by PLACE Design Group for Barrick (Osborne) Pty Ltd.**

Aim: to build upon the body of environmental information accumulated by previous studies.

Methodology:

Study Area Size – 963 ha

Database Searches – EPBC, Wildnet, Essential Habitat Mapping,

Flora – meander surveys within each vegetation community identified in the 2008 study;

Fauna – habitat assessment, Elliott traps, cage traps, pitfall traps, ground hair funnels, anabat, active diurnal herpetofauna searches, diurnal bird searches, spotlighting, diurnal and nocturnal call playback; and

Timing – immediately post wet season – 24-29 March 2010.

Summary:

Vegetation recorded from the Investigation Area is common and characteristic of the wider landscape and has generally been degraded by grazing and inappropriate burning regimes. Eight distinct vegetation communities analogous with five Regional Ecosystems (and 8 sub-RE types) were identified within the Investigation Area. At a State level all of the Regional Ecosystems present have a management status under the *Vegetation Management Act 1999* of *Least Concern*; two have a biodiversity status of *Of Concern* and one *Endangered* under the Department of Environment and Resource Management assessment process. None of the Regional Ecosystems are Threatened Ecological Communities under Commonwealth (*Environment Protection and Biodiversity Conservation Act 1999*) legislation.

No threatened flora species listed under Commonwealth (*Environment Protection and Biodiversity Conservation Act 1999*) or State (*Nature Conservation Act 1992*) Legislation were identified in the Investigation Area, nor are they anticipated to exist. Although a number of State declared weed species (subject to the provisions of the *Land Protection (Pest and Stock Route) Management Act 2002*) occur in the surrounding landscape, none were identified on site.

Habitats present throughout much of the Investigation Area are widespread and common in the surrounding landscape. Well-developed riparian vegetation such as that occurring along the Mort River is more uncommon and likely to be a focus of activity (and a movement corridor) for many fauna species. Rocky outcrops are a focus of activity for reptiles and animals dependant on caves for roosting, foraging and shelter. Sixteen threatened fauna species have been identified as occurring or potential occurring in the Investigation Area or close surrounds. Of these the Square-tailed Kite and *Heteromunia pectoralis* (Pictorella Mannikin) both *Rare* under the *Nature Conservation Act 1994* have been recorded on the site by the present study. The *Petrogale purpureicollis* (Purple-necked Rock-wallaby) considered *Vulnerable* in Queensland, is present to the south of the Investigation Area. Despite not being recorded, it is believed that a number of other threatened bird species and the *Macroderma gigas* (Ghost Bat) could occasionally overfly or utilise habitats in the Investigation Area.

- Comparison with DERM Guidelines:

Vegetation communities adequately sampled. Fauna survey techniques effectively targeted small mammals, bats, reptiles, birds and large mammals. Fauna habitat adequately assessed and described.

➤ **April 2009, 'Cloncurry Copper Project – Purple-necked Wallaby Survey'. Prepared by AARC for Exco Resources Ltd.**

Aim: The objective of the survey was to assess habitat areas and complexity, provide estimated populations within outcrops on and surrounding the Monakoff project area and propose potential mitigation strategies for populations that may be affected by the Project.

Methodology:

Field Survey – active searches on foot; and

Timing – late September, early October 2008.

Summary:

Provides information on the behaviour, conservation status and habitat requirements of the purple-necked wallaby. Thirteen individuals were observed over four sites within the Monakoff Project Area. A further sixteen individuals were observed over three sites in the surrounding area. Rocky areas containing deep caves, vertical crevices and interconnected tunnels provided better habitat and generally had more Purple-necked Rock-wallabies and higher scat densities.

Database Searches

Department of Environment, Water Heritage and the Arts (2010) “EPCB Act Protected Matters Report” Accessed at <http://www.environment.gov.au/erin/ert/epbc/index.html> 21 June 2010.

1 Threatened Ecological Community : The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin (Endangered)

11 Threatened Species:

Erythrura gouldiae Gouldian Finch (E) Species or habitat known to occur within area

Pezoporus occidentalis Night Parrot (E) Species or habitat likely to occur within area

Rostratula australis Australian Painted Snipe (V) Species or habitat may occur within area

Dasyercus hillier Ampurta (E) Species or species habitat may occur within area

Macrotis lagotis Greater Bilby (V) Species or species habitat likely to occur within area

Sminthopsis douglasi Julia Creek Dunnart (E) Species or habitat likely to occur within area

Pristis microdon Freshwater Sawfish (V) Species or species habitat likely to occur within area

Acacia peuce Waddy, Waddi, Waddy-wood, Birdsville Wattle (V) Species or species habitat likely to occur within area

Callistemon sp. Boulia (L.Pedley 5297) (V) Species or species habitat likely to occur within area

Eremophila tetraptera (V) Species or species habitat likely to occur within area

Sclerolaena walkeri (V) Species or species habitat likely to occur within area

23 Migratory Species:

Erythrura gouldiae Gouldian Finch

Haliaeetus leucogaster White-bellied Sea-Eagle

Merops ornatus Rainbow Bee-eater

Pezoporus occidentalis Night Parrot
Ardea alba Great Egret, White Egret
Ardea ibis Cattle Egret
Calidris acuminata Sharp-tailed Sandpiper
Calidris ferruginea Curlew Sandpiper
Calidris ruficollis Red-necked Stint
Charadrius mongolus Lesser Sand Plover, Mongolian Plover
Charadrius veredus Oriental Plover, Oriental Dotterel
Glareola maldivarum Oriental Pratincole
Limosa lapponica Bar-tailed Godwit
Limosa limosa Black-tailed Godwit
Numenius minutes Little Curlew, Little Whimbrel
Numenius phaeopus Whimbrel
Pluvialis fulva Pacific Golden Plover
Rostratula benghalensis s. lat. Painted Snipe
Tringa glareola Wood Sandpiper
Tringa stagnatilis Marsh Sandpiper, Little Greenshank

Migratory Marine Birds

Apus pacificus Fork-tailed Swift
Ardea alba Great Egret, White Egret
Ardea ibis Cattle Egret

Department of Environment and Resource Management, Queensland Parks and Wildlife Service (2010), “Wildlife Online Extract” Accessed at http://www.derm.qld.gov.au/wildlife-ecosystems/wildlife/wildlife_online/ , 21 June 2010.

One species recorded - Purple-necked rock wallaby (*Petrogale purpureicollis*) Vulnerable.

Appendix C EPBC Protected Matters of National Environmental Significance



Australian Government

Department of the Environment, Water, Heritage and the Arts

Protected Matters Search Tool

You are here: [Environment Home](#) > [EPBC Act](#) > [Search](#)

30 September 2010 16:39

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.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at <http://www.environment.gov.au/atlas> may provide further environmental information relevant to your selected area. 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>

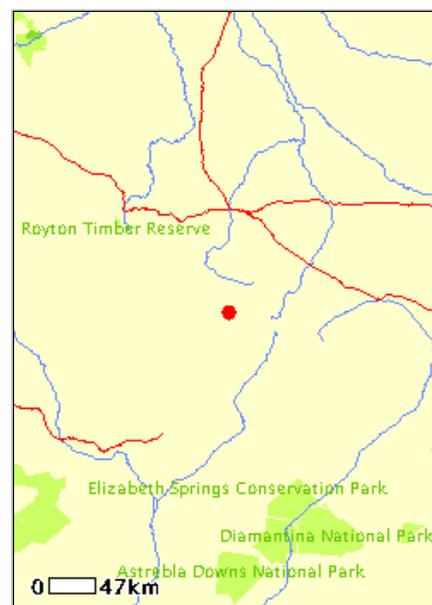
Search Type: Point
Buffer: 200 km
Coordinates: -21.690999,140.48033



Report Contents: [Summary](#)
[Details](#)

- [Matters of NES](#)
- [Other matters protected by the EPBC Act](#)

• [Extra Information](#)
[Caveat](#)
[Acknowledgments](#)



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Summary

Matters of National Environmental 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:	1
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1

Threatened Species:	14
Migratory Species:	23

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>.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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.au/epbc/permits/index.html>.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Places on the RNE:	25
Listed Marine Species:	24
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 nominated.

State and Territory Reserves:	4
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

National Heritage Places [[Dataset Information](#)]

[Great Artesian Basin Springs: Elizabeth QLD](#)

Wetlands of International Significance [[Dataset Information](#)]
(Ramsar Sites)

[COONGIE LAKES](#)

Within same catchment as Ramsar site

Threatened Ecological Communities [[Dataset Information](#)]

Status	Type of Presence
--------	------------------

[The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin](#)

Endangered	Community known to occur within area
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Threatened Species [[Dataset Information](#)]

Status	Type of Presence
--------	------------------

Birds

Erythrura gouldiae Gouldian Finch	Endangered	Species or species habitat known to occur within area
Pedionomus torquatus Plains-wanderer	Vulnerable	Species or species habitat likely to occur within area
Pezoporus occidentalis Night Parrot	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area

Mammals

Dasycercus hillieri Ampurta	Endangered	Species or species habitat may occur within area
Dasyuroides byrnei Kowari	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby	Vulnerable	Species or species habitat likely to occur within area
Sminthopsis douglasi Julia Creek Dunnart	Endangered	Species or species habitat likely to occur within area

Ray-finned fishes

Chlamydogobius micropterus Elizabeth Springs Goby	Endangered	Species or species habitat likely to occur within area
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Sharks

Pristis microdon Freshwater Sawfish	Vulnerable	Species or species habitat likely to occur within area
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Plants

Acacia peuce Waddy, Waddi, Waddy-wood, Birdsville Wattle	Vulnerable	Species or species habitat likely to occur within area
Eremophila tetraptera	Vulnerable	Species or species habitat likely to occur within area
Eriocaulon carsonii Salt Pipewort, Button Grass	Endangered	Species or species habitat likely to occur within area
Sclerolaena walkeri	Vulnerable	Species or species habitat likely to occur within area

Migratory Species [[Dataset Information](#)]

Migratory Terrestrial Species**Birds**

Erythrura gouldiae Gouldian Finch	Migratory	Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot	Migratory	Species or species habitat likely to occur within area

Migratory Wetland Species**Birds**

Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper	Migratory	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper	Migratory	Species or species habitat known to occur within area
Calidris ruficollis	Migratory	Species or species habitat known to occur

Red-necked Stint		within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Migratory	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Migratory	Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole	Migratory	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit	Migratory	Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit	Migratory	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel	Migratory	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel	Migratory	Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover	Migratory	Species or species habitat known to occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Tringa glareola Wood Sandpiper	Migratory	Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank	Migratory	Species or species habitat known to occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [[Dataset Information](#)]

Birds

	Status	Type of Presence
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper	Listed	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper	Listed - overfly marine area	Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint	Listed - overfly marine area	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Listed	Species or species habitat known to occur within area

Charadrius ruficapillus Red-capped Plover	Listed - overfly marine area	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Listed - overfly marine area	Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole	Listed - overfly marine area	Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Himantopus himantopus Black-winged Stilt	Listed - overfly marine area	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit	Listed	Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit	Listed - overfly marine area	Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Numenius minutus Little Curlew, Little Whimbrel	Listed - overfly marine area	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel	Listed	Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover	Listed	Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet	Listed - overfly marine area	Species or species habitat known to occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Stiltia isabella Australian Pratincole	Listed - overfly marine area	Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper	Listed - overfly marine area	Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank	Listed - overfly marine area	Species or species habitat known to occur within area
Reptiles		
Crocodylus johnstoni Freshwater Crocodile	Listed	Species or species habitat may occur within area
Commonwealth Lands [Dataset Information]		

Defence

Places on the RNE [[Dataset Information](#)]

Note that not all Indigenous sites may be listed.

Historic

[Cloncurry Courthouse QLD](#)

[Stone House QLD](#)

[Tent House QLD](#)

Indigenous

[Anvil Creek Art Sites 1 to 4 QLD](#)

[Bower Bird Area QLD](#)

[Carbine Creek Area QLD](#)

[Colinaringo Stone Arrangement QLD](#)

[Cuckadoo Site 1 QLD](#)

[Cuckadoo Sites 3 and 4 QLD](#)

[De Little Plateau 1 Area QLD](#)

[Deighton Pass Site QLD](#)

[Doolans Rockhole Site QLD](#)

[Flyveil Axe Quarry QLD](#)

[Jarra Dreaming Site QLD](#)

[Kalkadoon Echidna Dreaming Site Complex QLD](#)

[Lake Moondarra Quarry 1 Area QLD](#)

[Mucklandama Creek Area QLD](#)

[Pelican Soak Site QLD](#)

[Selwyn Ranges Art Site 1 QLD](#)

[Selwyn Ranges Art Site 2 QLD](#)

[The Granites Area QLD](#)

[Wonomo Waterhole and Molvos Grave QLD](#)

Natural

[Beetle Creek Area QLD](#)

[Elizabeth Springs QLD](#)

[Fountain Range QLD](#)

Extra Information

State and Territory Reserves [[Dataset Information](#)]

Combo 1 Conservation Park, QLD

Combo 2 Conservation Park, QLD

Diamantina National Park, QLD

Elizabeth Springs Conservation Park, QLD

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 resolutions.

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 information sources.

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 [migratory](#) and [marine](#) provisions of the Act have been mapped.

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.

Acknowledgments

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

- [New South Wales National Parks and Wildlife Service](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Water and Environment, Tasmania](#)
- [Department of Environment and Heritage, South Australia Planning SA](#)
- [Parks and Wildlife Commission of the Northern Territory](#)
- [Environmental Protection Agency, Queensland](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [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](#)
- Other groups and individuals

[ANUcliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University](#) was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Last updated: Thursday, 20-Nov-2008 14:17:56 EST

[Department of the Environment, Water, Heritage and the Arts](#)

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Appendix D Wildnet Database



Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: Native
Status: Rare and threatened species
Records: All
Date: All
Latitude: 21.691
Longitude: 140.4803
Distance: 25
Email: dtaylor@placedesigngroup.com
Date submitted: Thursday 30 Sep 2010 15:57:41
Date extracted: Thursday 30 Sep 2010 16:01:15

The number of records retrieved = 1

Disclaimer

As the DERM is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	mammals	Macropodidae	<i>Petrogale purpureicollis</i>	purple-necked rock-wallaby		V		1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.

This number is output as 999 if it equals or exceeds this value.

Appendix E Composite List of Fauna

TABLE E1: COMPOSITE FAUNA SPECIES LIST

Species Name	Common Name	Source								Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'with	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekellano – 50 km W	Barrack – 25 km SW	Cannington Mine - 50 km SE	Lady Loretta (Mt Isa) - 290 km SE		
Amphibians											
Hylidae											
<i>Litoria caerulea</i>	green tree frog				X		X				
<i>Litoria rubella</i> ^o	desert tree frog		X		X		X				
<i>Cyclorana australis</i> ^o	water holding frog		X	X	X						
Myobatrachidae											
<i>Opisthodon ornatus</i> ^o	ornate burrowing frog		X								
Bufoidea											
<i>Rhinella marina</i>	cane toad		X				X				
Total amphibians	3 Families, 5 Species										
Reptiles											
Agamidae											
<i>Amphiloburus gilberti</i>	Gilbert's dragon	X		X					X		
<i>Amphiloburus nobbi</i>	nobbi dragon								X		
<i>Ctenophorus caudicinctus</i> ^o	ring-tailed dragon	X	X		X			X	X		
<i>Ctenophorus isolepis</i> ^o	central military dragon	X	X								
<i>Diporiphora magna</i> ^o	yellow-sided two-lined dragon	X	X								
<i>Diporiphora winneckeii</i> ^o	canegrass two-lined	X	X								

Species Name	Common Name	Source									Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities			C'w/th	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE	Cloncurry Copper Project purple-necked rock-wallaby 80 km N		
	dragon											
<i>Heteronotia binoei</i>	Bynoe's gecko			X								
<i>Pogona vitticeps</i> *	central bearded dragon		X		X		X			X		
<i>Pogona henrylawsoni</i> °	Downs bearded dragon		X									
Boidae												
<i>Aspidites melanocephalus</i>	Black-headed python								X	X		
<i>Liasis childreni</i>	children's python				X		X		X			
<i>Morelia spilota</i>	diamond python				X							
Elapidae												
<i>Acanthopis antarcticus</i>	common death adder					X	X		X	X		NT
<i>Demansia olivacea</i>	olive whipsnake									X		
<i>Oxyuranus microlepidotus</i>	fierce snake				X							
<i>Pseudonaja australis</i>	king brown snake									X		
<i>Pseudonaja colletti</i>	Collett's snake					X						
<i>Pseudonaja nuchalis</i>	western brown snake	X										
<i>Pseudonaja textilis</i>	eastern brown snake	X	X				X			X		
<i>Vermicella annulata</i>	bandy-bandy								X			
Gekkonidae												
<i>Diplodactylus immaculatus</i>	unknown				X							
<i>Gehyra dubia</i>	dubious gecko				X		X			X		
<i>Gehyra robusta</i>	Eastern rock dtella								X			
<i>Nephrurus asper</i>	Spiny knob-tailed gecko								X	X		
<i>Rhynchoedura ornata</i>	beaked gecko				X							

Species Name	Common Name	Source								Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'w/th	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE		
Pygopodidae											
<i>Lialis burtonis</i>	Burton's snake-lizard										X
Scincidae											
<i>Carlia amax</i>	amax litter skink								X		
<i>Ctenotus lateralis</i> ^o	gravelly-soil ctenotus		X						X	X	
<i>Ctenotus leonhardii</i>	Leonhardi's ctenitis				X						
<i>Ctenotus pantherinus</i>	Leopard ctenotus								X	X	
<i>Ctenotus pulchellus</i>	pretty ctenotus				X						
<i>Ctenotus robustus</i>	eastern striped skink										X
<i>Ctenotus striaticeps</i>	stripe-headed finesnout ctenotus								X		
<i>Eremiascincus richardsonii</i>	broad-banded sandswimmer										X
Typhlopidae											
<i>Ramphotyphlops sp.</i>	blind snake								X		
Varanidae											
<i>Varanus acanthurus</i>	ridge-tailed monitor				X				X		
<i>Varanus giananteus</i>	perentic	X								X	
<i>Varanus panoptes</i> [*]	yellow-spotted monitor		X								
<i>Varanus tristis</i>	black-headed monitor										X
Total reptiles	8 Families, 39 Species										

Species Name	Common Name	Source								Status		
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'w/th	Qld	
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE			Cloncurry Copper Project purple-necked rock-wallaby 80 km N
Birds												
Acanthizinae												
<i>Smicromnis brevirostris</i>	weebill	X	X									
Accipitridae												
<i>Accipiter cirrocephalus</i>	collared sparrowhawk										X	
<i>Accipiter fasciatus</i>	brown goshawk										X	
<i>Accipiter novaehollandiae</i>	grey goshawk					X						
<i>Aquila audax</i>	wedgetail eagle	X	X	X	X		X				X	
<i>Circus approximans</i>	swamp harrier		X									
<i>Circus assimilis</i>	spotted harrier	X									X	
<i>Elanus axillaris</i>	black-shouldered kite								X		X	
<i>Haliastur sphenurus</i>	whistling kite		X	X	X						X	
<i>Milvus migrans</i>	black kite	X	X	X	X		X		X		X	
<i>Lophoictinia isura</i>	square-tailed kite	X	X			X						NT
Aegothelidae												
<i>Aegotheles cristatus</i>	Australian owl-nightjar	X			X				X			
Alcedinidae												
<i>Halcyon pyrrhopygia</i>	red-backed kingfisher	X			X				X		X	
<i>Halcyon sancta</i>	sacred kingfisher	X			X		X				X	
Anatidae												
<i>Anas gibberifrons</i>	grey teal			X	X							
<i>Chenonetta jubata</i>	Australian wood duck	X			X							
<i>Malacorhynchus</i>	pink-eared duck			X								

Species Name	Common Name	Source								Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'w/th	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE		
<i>membranaceus</i>											
Apodidae											
<i>Apus pacificus</i>	fork-tailed swift			X							M
Ardeidae											
<i>Ardea ibis</i>	cattle egret		X	X							M
<i>Ardea pacifica</i>	white-necked heron	X	X	X					X		
<i>Egretta alba</i>	great egret	X			X						M
<i>Egretta novaehollandiae</i>	white-faced heron	X	X		X		X		X		
<i>Nycticorax caledonicus</i>	rufous night-heron	X		X					X		
Artamidae											
<i>Artamus cinereus</i>	black-faced woodswallow	X	X	X			X		X	X	
<i>Artamus minor</i>	little woodswallow	X	X	X	X		X			X	
<i>Artamus cyanopterus</i>	dusky woodswallow	X			X						
<i>Artamus leucorhynchus</i>	white-breasted woodswallow	X		X	X					X	
<i>Artamus personatus</i>	masked woodswallow	X			X		X			X	
<i>Artamus superciliosus</i>	white-browed woodswallow									X	
<i>Cracticus tibicen</i>	Australian magpie	X	X	X	X		X		X	X	
<i>Cracticus nigrogularis</i>	piebald butcherbird	X	X	X			X		X	X	
<i>Cracticus torquatus</i>	grey butcherbird	X	X						X		
Cacatuidae											
<i>Cacatua galerita</i>	sulphur-crested	X	X				X			X	

Species Name	Common Name	Source								Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'w/th	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE		
	cockatoo										
<i>Cacatua sanguinea</i>	little corella	X	X		X					X	
<i>Eolophus roseicapilla</i>	galah	X	X	X	X			X		X	
<i>Nymphicus hollandicus</i>	cockatiel		X	X	X		X			X	
Campephagidae											
<i>Lalage tricolor</i>	white-winged triller		X	X						X	
<i>Coracina maxima</i>	ground cuckoo-shrike	X	X	X							
<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike	X	X	X	X		X	X		X	
Caprimulgidae											
<i>Eurostopodus argus</i>	spotted nightjar	X	X	X			X	X		X	
Centropodidae											
<i>Centropus phasianus</i>	pheasant coucal									X	
Charadriidae											
<i>Charadrius melanops</i>	black-fronted dotterel	X		X							
<i>Erythrogonys cinctus</i>	red-kneed dotterel		X		X						
<i>Vanellus miles</i>	masked lapwing			X	X					X	
Ciconiidae											
<i>Ephippiorhynchus asiaticus</i>	Black-necked stork				X						
Climacteridae											
<i>Climacteris melanurus</i>	black-tailed treecreeper			X			X				
Columbidae											
<i>Geopelia cuneata</i>	diamond dove	X	X		X		X			X	

Species Name	Common Name	Source									Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities			C'w/th	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE	Cloncurry Copper Project purple-necked rock-wallaby 80 km N		
<i>Geopelia striata</i>	peaceful dove	X	X	X	X		X			X		
<i>Geophaps plumifera</i>	spinifex pigeon	X	X		X		X		X		X	
<i>Ocyphaps lophotes</i>	crested pigeon	X	X		X						X	
<i>Phaps chalcoptera</i>	common bronzewing pigeon	X	X		X		X				X	
<i>Phaps histrionica</i>	flock bronze-wing	X										
Corcoracidae												
<i>Struthidea cinerea</i>	apostlebird	X	X								X	
Corvidae												
<i>Corvus coronoides</i>	Australia raven	X	X	X	X		X		X			
<i>Corvus orru</i>	Torresian crow	X	X				X				X	
Cuculidae												
<i>Chrysococcyx basalis</i>	Horsfield's bronze-cuckoo											X
<i>Cuculus pallidus</i>	pallid cuckoo				X						X	
<i>Cacomantis variolosus</i>	brush cuckoo										X	
Dicaeidae												
<i>Dicaeum hirundinaceum</i>	mistletoebird				X		X		X			
Dicruridae												
<i>Grallina cyanoleuca</i>	magpie-lark	X	X	X	X		X		X		X	
<i>Myiagra inquieta</i>	restless flycatcher				X				X		X	
<i>Rhipidura albiscapa</i>	grey fantail										X	
<i>Rhipidura leucophrys</i>	willie wagtail	X	X	X	X		X				X	
<i>Rhipidura rufifrons</i>	rufous fantail				X							

Species Name	Common Name	Source								Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'w/th	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE		
Estrildidae											
<i>Emblema pictum</i>	painted finch	X	X		X				X		
<i>Heteromunia pectoralis</i>	pictorella mannikin		X		X		X			X	NT
<i>Poephila acuticauda</i>	long-tailed finch						X				
<i>Taeniopygia bichenovii</i>	double-barred finch									X	
<i>Taeniopygia guttata</i>	zebra finch	X	X	X	X		X		X	X	
Falconidae											
<i>Falco berigora</i>	brown falcon	X	X	X					X	X	
<i>Falco cenchroides</i>	nankeen kestrel		X	X	X				X		
<i>Falco longipennis</i>	Australian hobby	X	X							X	
<i>Falco peregrinus</i>	peregrine falcon	X			X						
<i>Falco hypoleucos</i>	grey falcon	X		X							NT
Glareolidae											
<i>Stiltia isabella</i>	Australian pratincole			X							
Gruidae											
<i>Grus rubicunda</i>	brolga		X		X						
Halcyonidae											
<i>Dacelo leachii</i>	blue-winged kookaburra								X		
Hirundinidae											
<i>Hirundo ariel</i>	Fairy martin								X		
<i>Hirundo neoxena</i>	welcome swallow		X								
Maluridae											
<i>Amytornis purnelli</i>	kalkadoon grasswren	X							X		

Species Name	Common Name	Source									Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities			C'wlth	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekellano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE	Cloncurry Copper Project purple-necked rock-wallaby 80 km N		
<i>ballarae</i>												
<i>Malurus lamberti</i>	variegated fairy-wren	X	X	X			X			X		
<i>Malurus leucopterus</i>	white-winged fairy-wren	X		X								
<i>Stipiturus ruficeps</i>	rufous-crowned emu-wren	X							X			
Meliphagidae												
<i>Acanthagenys rufogularis</i>	spiny-cheeked honeyeater				X				X			
<i>Certhionyx niger</i>	black honeyeater										X	
<i>Conopophila rufogularis</i>	rufous-throated honeyeater										X	
<i>Epthianura crocea</i>	yellow chat	X										
<i>Epthianura tricolor</i>	crimson chat			X								
<i>Lichenostomus flavescens</i>	yellow-tinted honeyeater						X					
<i>Lichenostomus keartlandi</i>	grey-headed honeyeater	X	X	X	X				X		X	
<i>Lichenostomus penicillatus</i>	white-plumed honeyeater	X	X	X	X						X	
<i>Lichenostomus plumulus</i>	grey-fronted honeyeater						X					
<i>Lichenostomus virescens</i>	singing honeyeater	X									X	
<i>Lichmera indistincta</i>	brown honeyeater	X					X				X	
<i>Manorina flavigula</i>	yellow-throated miner	X		X	X		X		X		X	
<i>Manorina melanocephala</i>	noisy minor	X										
<i>Meliphagidae grantiella</i>	painted honeyeater					X						
<i>Meliphagidae gulgaris</i>	black-chinned honeyeater						X			X		NT

Species Name	Common Name	Source									Status		
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities			C'w/th	Qld	
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE	Cloncurry Copper Project purple-necked rock-wallaby 80 km N			
<i>Philemon argenticeps</i>	silver-crowned friarbird						X						
<i>Philemon citreogularis</i>	little friarbird	X	X									X	
<i>Philemon corniculatus</i>	noisy friarbird		X										
Meropidae													
<i>Merops ornatus</i>	rainbow bee-eater	X	X	X	X							X	M
Motacillidae													
<i>Anthus novaeseelandiae</i>	Richard's pipit	X	X	X	X								
Oriolidae													
<i>Oriolus sagittatus</i>	olive-backed oriole											X	
Otididae													
<i>Ardeotis australis</i>	Australian bustard	X	X										
Pardalotidae													
<i>Acanthiza chrysorrhoa</i>	yellow-rumped thornbill											X	
<i>Pardalotus rubricatus</i>	Red-browed pardalote											X	
<i>Pardalotus striatus</i>	Striated pardalote											X	
Pachycephalidae													
<i>Colluricincla harmonica</i>	grey shrike-thrush									X		X	
<i>Colluricincla woodwardi</i>	sandstone shrike-thrush									X			
<i>Oreoica gutturalis</i>	crested bellbird	X	X	X						X			
<i>Pachycephala rufiventris</i>	rufous whistler		X	X							X	X	
<i>Pachycephala pectoralis</i>	golden whistler					X							
Pelicanidae													
<i>Pelecanus conspicillatus</i>	Australian pelican											X	

Species Name	Common Name	Source								Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'w/th	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE		
Petroicidae											
<i>Melanodryas cucullata</i>	hooded robin	X	X		X		X		X		
<i>Microeca fascinans</i>	Jacky winter	X	X	X	X		X			X	
<i>Petroica goodenovii</i>	red-capped robin									X	
Phalacrocoracidae											
<i>Anhinga melanogaster</i>	dartar	X									
<i>Phalacrocorax melanoleucos</i>	little pied cormorant	X									
<i>Phalacrocorax sulcirostris</i>	little black cormorant	X									
<i>Phalacrocorax varius</i>	pied cormorant				X						
Phasianidae											
<i>Coturnix ypsilophora</i>	brown quail	X	X							X	
<i>Coturnix novaezealandiae</i>	stubble quail				X						
Plataleidae											
<i>Plegadis falcinellus</i>	glossy ibis				X						
<i>Threskiornis spinicollis</i>	straw-necked ibis				X						
Podargidae											
<i>Podargus strigoides</i>	tawny frogmouth		X		X		X				
Podicipedidae											
<i>Tachybaptus novaehollandiae</i>	Australasian grebe				X						
Pomatostomidae											
<i>Pomatostomus temporalis</i>	grey-crowned babbler	X	X	X	X		X			X	

Species Name	Common Name	Source								Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'wth	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE		
Psittacidae											
<i>Aprosmictus erythropterus</i>	red-winged parrot	X			X				X	X	
<i>Barnardiua zonarius (Macgillivrayi)</i>	Australian ringneck parrot	X	X	X	X					X	
<i>Melopsittacus undulatus</i>	budgerigar	X	X		X				X	X	
Ptilonorhynchidae											
<i>Ptilonorhynchus maculatus</i>	spotted bowerbird				X		X		X	X	
Strigidae											
<i>Ninox novaeseelandiae</i>	southern boobook		X						X	X	
<i>Ninox connivens</i>	barking owl				X						
Struthionidae											
<i>Dromaius novaehollandiae</i>	emu		X				X			X	
Sylviidae											
<i>Cincloramphus cruralis</i>	brown songlark		X								
<i>Cincloramphus mathewsi</i>	rufous songlark		X		X					X	
<i>Eremiornis carteri</i>	spinifexbird	X	X				X		X		
Threskiornithidae											
<i>Threskiornithidae spiniacollis</i>	straw-necked ibis									X	
Turnicidae											
<i>Turnix pyrrhothorax</i>	red-chested button quail									X	

Species Name	Common Name	Source									Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities			C'wlth	Qld
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<i>Turnix velox</i>	little button quail		X					X		X		
Tytonidae												
<i>Tyto alba</i>	barn owl		X									
Total birds	51 Families, 142 Species											
Mammals												
Bovidae												
<i>Capra aegagrus hircus</i>	goat					X						
Bovinae												
<i>bos taurus</i>	cattle	X	X									
Camelidae												
<i>Camelus dromedarius</i>	camel		X					X				
Canidae												
<i>Canis familiaris dingo</i>	dingo				X	X	X	X				
<i>Vulpes vulpes</i>	fox					X						
Dasyuridae												
<i>Planigale tenuirostris</i>	narrow-nosed planigale							X				
<i>Pseudantechinus mimulus</i>	carpentarian pseudantechinus							X			V	V
<i>Sminthopsis macroura</i>	stripe-faced dunnart							X				
<i>Sminthopsis sp.</i>	striped-faced or fat-tailed dunnart?		X									

Species Name	Common Name	Source									Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities			C'wlth	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE	Cloncurry Copper Project purple-necked rock-wallaby 80 km N		
Emballonuridae												
<i>Saccolaimus flaviventris</i>	yellow-bellied sheathtail bat	X	X				X					
<i>Taphozous georgianus</i>	common sheathtail bat	X					X		X			
<i>Taphozous troughtoni</i> #	Troughton's sheathtail bat	X				X						E
<i>Taphozous sp.</i> #	unidentified sheathtail bat		X									
Equidae												
<i>Equus ferus caballus</i>	horse		X				X					
Felidae												
<i>Felis catus</i>	feral cat	X			X	X						
Hipposideridae												
<i>Hipposideros stenotis</i>	northern leaf-nosed bat						X					
Lagomorpha												
<i>Oryctolagus cuniculus</i>	rabbit	X			X							
Macropodidae												
<i>Macropus rufus</i> *	red kangaroo	X	X	X	X		X		X			
<i>Macropus robustus</i>	comon wallaroo	X	X	X	X		X		X			
<i>Macropus giganteus</i>	eastern grey kangaroo	X	X		X				X			
<i>Onychogalea unguifera</i> *	northern nailtail wallaby	X										
<i>Petrogale purpureicollis</i> *	purple-necked rock-wallaby	X		X				X		X		V
Molossidae												

Species Name	Common Name	Source									Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities			C'wlth	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine – 50 km SE	Lady Loretta (Mt Isa) – 290 km SE	Cloncurry Copper Project purple-necked rock-wallaby 80 km N		
<i>Chaerephon jobensis</i> [#]	northern freetail bat	X	X				X		X			
<i>Mormopterus beccarii</i> [#]	Beccari's freetail bat		X				X					
<i>Mormopterus sp.</i>	little northern freetail bat						X					
Muridae												
<i>Pseudomys desertor</i>	desert mouse								X			
<i>Zyomys argurus</i>	common rock rat	X					X		X			
<i>Rattus villosissimus</i>	long-haired rat								X			
Murinae												
<i>Mus musculus</i> *	house mouse	X			X							
<i>Notomys alexis</i> ^o	spinifex hopping mouse		X									
<i>Rattus Rattus</i>	black rat	X										
Suidae												
<i>Sus scrofa</i>	feral pig		X			X						
Tachyglossus												
<i>Tachyglossus aculeatus</i> *	short-beaked echidna	X	X		X				X			
Vespertilionidae												
<i>Chalinolobus nigrogriseus</i> [#]	hoary wattled bat		X				X					
<i>Chalinolobus gouldii</i>	Gould's wattled bat	X	X				X					
<i>Miniopterus australis</i>	little bentwing bat								X			
<i>Nyctophilus arnhemensis</i>	northern long-eared bat						X					
<i>Nyctophilus sp</i> [#]	unidentified long-eared bat	X	X									
<i>Scotorepens balstoni</i> [#]	inland broad-nosed bat		X									

Species Name	Common Name	Source								Status	
		Ivanhoe Mine Lease Areas			Barrack Mine Lease Areas			Other Localities		C'wlth	Qld
		Current Survey	Selwyn – Lady Ella	Selwyn – Merlin Dam Site	Luck Luke Satellite – 10-20 km	Trekelano – 50 km W	Barrack – 25 km SW	Cannington Mine - 50 km SE	Lady Loretta (Mt Isa) - 290 km SE		
<i>Scotorepens greyii</i> [#]	little broad-nosed bat		X								
<i>Scotorepens influatus</i>	Hughenden broad-nosed bat							X			
<i>Vespadelus finlaysoni</i>	inland cave bat	X	X				X		X		
Total mammals	17 Families, 41 Species										

[#] Species identified as probable or possible by bat expert Glenn Hoye

^{*} Species identified during current surveys using scat analysis by expert Barbara Triggs

Appendix F Flora List

TABLE F1: FLORA SPECIES LIST

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	DECLINE AREA		ACCESS ROAD										
				RE1.5.3	RE1.11.2	RE1.5.3	RE1.11.2	RE1.3.7	RE1.5.3/1.11.2	RE1.5.3	RE1.5.3/1.11.2	RE1.3.7	RE1.5.3	RE 1.3.7	RE1.3.7	
AMARANTHACEAE	<i>Alternanthera nodiflora</i>	common joyweed		O	O							O			O	C
AMARANTHACEAE	<i>Ptilotus calostachyus</i>	weeping mulla mulla		O	O											
AMARANTHACEAE	<i>Ptilotus exaltatus</i>	lambs tail		O	O	O	O									
AMARANTHACEAE	<i>Ptilotus schwartzii</i>	horse mulla mulla		C	C	A	A		A							
APOCYNACEAE	<i>Carissa lanceolata</i>	conker berry		C		A	A		A	C	A	A	A	A	A	A
ASTERACEAE	<i>Bidens bipinnata</i>	beggars ticks	*													O
ASTERACEAE	<i>Pluchea dentex</i>			O		C	C	C			C	C			C	C
ASTERACEAE	<i>Pluchea dunlopii</i>			O	O											
ASTERACEAE	<i>Pterocaulon serrulatum</i>	apple bush		A	A	C	C	O			C	C				C
ASTERACEAE	<i>Pterocaulon sphacelatum</i>	fruit salad plant		C	C	O	O									
ASTERACEAE	<i>Streptoglossa decurrens</i>	a mintbush		C	O	C	C									
BORAGINACEAE	<i>Trichodesma zeylanicum var. zeylanicum</i>	camel bush			O								O			O
PENTAPETACEAE	<i>Waltheria indica</i>	waltheria			O											
CAESALPINIACEAE	<i>Senna artemisioides subsp. helmsii</i>	crinkled cassia		O	O	O	O									
CAESALPINIACEAE	<i>Senna artemisioides subsp. oligophylla</i>	limestone cassia		A	A	A	A	C			O			O	O	O
CAESALPINIACEAE	<i>Senna artemisioides subsp. sturtii</i>	grey cassia				O	O							O		
CAESALPINIACEAE	<i>Senna glutinosa ssp. pruinosa</i>	silver cassia		A	A	C	C									
CAESALPINIACEAE	<i>Senna notabilis</i>	cockroach bush		A	A	C	C	C			C					
CARYOPHYLLACEAE	<i>Polycarpaea brevifolia</i>	pretty polly				O	O									
CARYOPHYLLACEAE	<i>Polycarpaea spirostylis</i>	northern pretty polly				O	O									
CAPPARACEAE	<i>Capparis lasiantha</i>	nipan		C	O	A	A									
CAPPARACEAE	<i>Capparis umbonata</i>	northern wild orange				O	O									
CAPPARACEAE	<i>Cleome viscosa</i>	tickweed		O	O	O	O								O	O
CELASTRACEAE	<i>Maytenus cunninghamii</i>	yellowberry bush		O		C	C		C	O				C		O
CHENOPODIACEAE	<i>Chenopodium sp.</i>					O	O									O
CHENOPODIACEAE	<i>Maireana georgei</i>	satiny bluebush		O		O	O									
CHENOPODIACEAE	<i>Salsola kali</i>	soft roly poly		O		O	O									

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	DECLINE AREA		ACCESS ROAD											
				RE1.5.3	RE1.11.2	RE1.5.3	RE1.11.2	RE1.3.7	RE1.5.3/ 1.11.2	RE1.5.3	RE1.5.3/ 1.11.2	RE1.3.7	RE1.5.3	RE 1.3.7	RE1.3.7		
CHENOPODIACEAE	<i>Sclerolaena cornishiana</i>			O		O	O										
CONVOLVULACEAE	<i>Evolvulus alsinoides</i>	tropical speedwell		O	O												
CONVOLVULACEAE	<i>Ipomoea plebia</i>	bell vine															O
CUCURBITACEAE	<i>Mukia maderaspatana</i>	red cucumber		C	C	C	C										O
CYPERACEAE	<i>Cyperus sp.1</i>																O
CYPERACEAE	<i>Cyperus sp.2</i>																O
EUPHORBIACEAE	<i>Chamaesyce australe</i>	caustic weed			O												
EUPHORBIACEAE	<i>Euphorbia tannensis</i>	desert spurge		O	O	O	O										
EUPHORBIACEAE	<i>Sarcostemma viminalis subsp australe</i>	caustic bush		O	O	O	O										
FABACEAE	<i>Indigofera linifolia</i>	narrow leaved indigo		O	O												
FABACEAE	<i>Sesbania cannabina</i>	sesbania pea															O
FABACEAE	<i>Tephrosia brachyodon</i>	narrow leaved tephrosia															O
FABACEAE	<i>Tephrosia sp.</i>			O													
FABACEAE	<i>Glycine tomentella</i>	woolly glycine														O	
GOODENIACEAE	<i>Scaevola ovalifolia var. ovalifolia</i>	bushy fan flower		O		O	O						O				
LAMIACEAE	<i>Ocimum tenuiflorum</i>	native thyme						O									
LAURACEAE	<i>Cassytha sp.</i>	dodder laurel															O
MALVACEAE	<i>Abutilon otocarpum</i>	desert Chinese lantern		O	O	O	O						O				O
MALVACEAE	<i>Gossypium australe</i>	native cotton		O		C	C	C	C		C	C	O				
MALVACEAE	<i>Hibiscus sturtii</i>	Sturt's hibiscus			O	O	O										
MALVACEAE	<i>Sida filiformis</i>			O		C	C						O				
MIMOSACEAE	<i>Acacia acradenia</i>			O	O	A	A			O	O	C	A				
MIMOSACEAE	<i>Acacia melleodora</i>					O	O		O				O				
MIMOSACEAE	<i>Acacia cambagei</i>	gidgee			A	A	A										
MIMOSACEAE	<i>Acacia chippendalei</i>	Chippendale's wattle		A	A	C	C			O							
MIMOSACEAE	<i>Acacia chisholmii</i>	Chisholm's wattle		D	D	D	D	D	D	D	D	D	D	D	D	D	D
MIMOSACEAE	<i>Acacia tenuissima</i>	narrow leaved wattle		O		O	O	O									
MIMOSACEAE	<i>Acacia gonoclada</i>					O	O			A	C	A	A	A	A	A	A
MYOPORACEAE	<i>Eremophila bignoniifolia</i>					O	O				C						
MYOPORACEAE	<i>Eremophila longifolia</i>	berrigan		C	C	A	A	C	C	A	C	A	A				A

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	DECLINE AREA		ACCESS ROAD										
				RE1.5.3	RE1.11.2	RE1.5.3	RE1.11.2	RE1.3.7	RE1.5.3/1.11.2	RE1.5.3	RE1.5.3/1.11.2	RE1.3.7	RE1.5.3	RE 1.3.7	RE1.3.7	
MYOPORACEAE	<i>Eremophila maculata</i>	spotted fuchsia bush		C	C	C	C	A								
MYRTACEAE	<i>Corymbia aparrerinja</i>	ghost gum														
MYRTACEAE	<i>Corymbia aspera</i>	rough-leaved ghost gum														
MYRTACEAE	<i>Corymbia terminalis</i>	western bloodwood		A	A	A	A		D	D	A	A	A			
MYRTACEAE	<i>Eucalyptus camaldulensis</i>	river redgum						D		O	O	D		D	D	
MYRTACEAE	<i>Eucalyptus leucophloia</i>	snappy gum		D	D	D	D	A	D	D	D	A	D			
MYRTACEAE	<i>Eucalyptus leucophylla</i>	Cloncurry box				O	O									
MYRTACEAE	<i>Eucalyptus normantonensis</i>	Normanton box		A	A	O	O									
NYCTAGINACEAE	<i>Boerhavia palludosa</i>	roly poly tar vine				O	O									O
PHYLLANTHACEAE	<i>Phyllanthus virgatus</i>														O	O
PENTAPETACEAE	<i>Melhania ovata</i>			O	O											
PENTAPETACEAE	<i>Waltheria indica</i>	waltheria				O	O					O				O
POACEAE	<i>Aristida contorta</i>	bunched kerosene grass		A	C	A	A	C	A							
POACEAE	<i>Aristida inaequiglumis</i>	feathertop threeawn		O	O	O	O	C							C	
POACEAE	<i>Cymbopogon obtectus</i>	silky heads		O		O	O				O	O	C			O
POACEAE	<i>Enneapogon oblongus</i>	purple head nineawn		C	C	C	C					O				O
POACEAE	<i>Eragrostis elongata</i>	clustered lovegrass									O					
POACEAE	<i>Heteropogon contortus</i>	black speargrass							O			A	A	A		
POACEAE	<i>Pennisetum ciliare</i>	buffel grass	*					D	O	A	D	D		A	A	D
POACEAE	<i>Sporobolus australasicus</i>	Australian dropseed		O		C	C									
POACEAE	<i>Themeda triandra</i>	kangaroo grass		O		O	O	A	C	A	A	A	A	A	A	O
POACEAE	<i>Triodia molesta</i>	pincushion spinifex		D	D	D	D	A	D	D	D	D	D	D	D	
POACEAE	<i>Tripogon loliiformis</i>	five minute grass		O		O	O									
PROTEACEAE	<i>Grevillea striata</i>	beefwood		C		C	C	O				A				O
PROTEACEAE	<i>Grevillea wickhamii</i>	holly leaved grevillea									A	A				
PROTEACEAE	<i>Hakea chordophylla</i>	bull oak		O	O	C	C									
RUBIACEAE	<i>Canthium latifolium</i>	native currant									C					
RUBIACEAE	<i>Oldenlandia galioides</i>													O		
RHAMNACEAE	<i>Alphitonia excelsa</i>	soap wood		O	O	O	O									
SANTALACEAE	<i>Santalum lanceolatum</i>	sandalwood		O		C	C		C		C	A				O

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	DECLINE AREA		ACCESS ROAD											
				RE1.5.3	RE1.11.2	RE1.5.3	RE1.11.2	RE1.3.7	RE1.5.3/ 1.11.2	RE1.5.3	RE1.5.3/ 1.11.2	RE1.3.7	RE1.5.3	RE 1.3.7	RE1.3.7		
SAPINDACEAE	<i>Atalaya hemiglauca</i>	whitewood		C	O	C	C					O	O				O
SAPINDACEAE	<i>Dodonaea lanceolata</i>													O			
SOLANACEAE	<i>Solanum chippendalei</i>	Chippendale's tomato		C	C	C	C										
SPARRMANNIACEAE	<i>Corchorus sidioides</i>	flannel jute			O	O	O										
SPARRMANNIACEAE	<i>Triumfetta sp.</i>																O
VIOLACEAE	<i>Hybanthus aurantiacus</i>	orange spade flower															O

Key:

Status: Presumed Extinct (X), Endangered (E), Vulnerable (V), Near Threatened (N), Rare (R), Naturalised (*), Doubtfully Naturalised (D), according to *Census of the Qld Flora. Qld EPA 2007*

Abundance: Dominant (D), Associated (A), Common (C), Occasional (O).

Appendix G Fauna Methods

G1 FAUNA SURVEY METHODOLOGY

G1.1 Database Review

A review of both Federal and State conservation databases was performed to provide an updated list of species that have been recorded or potentially occur within the locality. Data from Commonwealth (*EPBC Act and Matters of National Environmental Significance*) and Queensland (WildNet) databases were collected for the area comprising a 25 kilometre radius around the northern (Data Search Area: Latitude: 21.5342, Longitude: 140.495) and southern (Data Search Area: Latitude: 21.7778, Longitude: 140.4722) extents of the Investigation Area. In addition, previous reports undertaken in the region were consulted to form a composite list of fauna species which have been recorded within the Investigation Area or in nearby localities (**Appendix E**). Refer to **Section 3.2 – Threatened Species Considerations** for a detailed description of database reviews and previous surveys.

Based on the composite list compiled from these reviews, targeted fauna surveys could be developed. These were to be conducted either during or in conjunction with systematic sampling of the Impact Area. Fauna habitats represented in the Investigation Area and their consequent potential importance particularly threatened species, were initially identified from aerial photograph interpretation and vegetation mapping.

G1.2 Sampling Methodology

G1.2.1 Sampling Conditions

The field assessment was undertaken over the period 15th – 23rd September 2010. Weather data for the survey period was typically characterised by cold, windy and wet diurnal conditions, and cold nocturnal temperatures. Conversely, the first and last days of the survey were typically hot and sunny. Details regarding daily and hourly weather conditions are provided in **Appendix H**. In the weeks prior to survey commencement, the region experience hot and dry conditions. Generally, the conditions during the survey period could be considered sufficient for a fauna and flora survey.

G1.3 Field Methods

The survey was conducted under Environmental Protection Agency (EPA) Scientific Purposes Permit (WISP04846407) issued to PLACE, and carried Animal Ethics Committee Project Approval (CA 2009/02/339) issued by the Department of Primary Industries & Fisheries Community Access.

Fauna were surveyed by Mitchell Taylor (Senior Environmental Scientist / Ecologist) and Grant Brearley (Environmental Scientist / Ecologist). Surveys utilised a number of standard live trapping, active searches, and direct and indirect observation methods to determine the presence of fauna and their associated habitats occurring in the area (**Table I1**). While all fauna groups were assessed, additional effort was placed on identifying in the field and searching habitats that could contain species of conservation significance.

G1.3.1 Fauna Community Surveys

A number of habitat types were encountered throughout the Investigation Area during the surveys conducted. Different survey techniques were employed to search for specific fauna assemblages which have outlined below.

G1.3.1.1 Amphibians

A number of survey techniques were employed to search for amphibian species throughout the Investigation Area. These surveys included the use of pitfall trapping

(Decline Area), diurnal searches of shelter habitat, nocturnal spotlighting searches throughout different habitats, and listening for frog calls.

G1.3.1.2 Reptiles

A number of qualified searches and techniques were employed throughout the survey to search for reptilian species within the Investigation Area. These surveys included pitfall and Elliot (both A & B box type) trapping, diurnal searches of shelter; nocturnal spotlighting, and 20 minute targeted reptile searches along trap line and high quality habitat types each morning and afternoon within the Decline Area. Active searches were conducted for reptile in suitable habitat throughout the Investigation Area.

G1.3.1.3 Avifauna

A daily dawn and dusk survey of each trap line (Decline Area) was conducted with the aid of binoculars and listening for bird calls. Further to this, diurnal searches of suitable habitat throughout the Investigation Area were employed as well as diurnal and nocturnal call play back and spotlighting within nocturnal traverses. All incidental sightings of avifauna were also recorded throughout the Investigation Area.

G1.3.1.4 Mammals

A broad selection of trapping and search techniques were employed to look for mammalian species within the Decline Area survey effort. These included: Elliot traps, cage traps, hair tubes, pitfall traps, diurnal searches for shelter habitat, call playback, bat echolocation recording (ANABAT), and nocturnal spotlight searches while traversing suitable habitat on foot. Incidental sightings and searches in high quality habitat were conducted throughout the Investigation Area.

G1.4 Decline Area Methodology

G1.4.1 Habitats and Sampling Locations

Areas for the placement of trapping lines within the Impact Area were selected based on aerial photo interpretation and locations of proposed disturbance. Trap positioning was based on the representativeness of habitat types and disturbance areas. Of the 128.11 ha ML, a defined Impact Area of 10 ha was intensely surveyed, with the remaining areas assessed for habitat type and quality..

G1.4.1.1 Trapping Lines

Two trap lines were established across the majority of ecological gradients (vegetation communities) occurring within the Decline Area (**Figure 5**). The principle objectives of these trap lines were to gain an in-depth understanding of the fauna communities persisting specifically within the proposed disturbance areas, as well as those species that could potentially use these areas as part of their greater habitat range.

Trap line 1 was positioned to incorporate habitat types throughout the northern and eastern portions of the Decline Area (**Figure 5**). The habitat types comprised of;

- High rock ridges containing small rock piles and crevices, and a sparse groundcover of *Triodia molesta* (pincushion spinifex) and sporadic *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood);
- Higher slope gullies with dense groundcover of *Triodia molesta* (pincushion spinifex), and *Acacia chisholmii* (Chisholm's wattle) and/or *Acacia cambagei* (gidgee) on very rocky incised gullies;
- Steep to slightly undulating plains with a mixture of moderate and sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) with moderately dense *Triodia molesta* (pincushion spinifex) clumps.

Trap line 2 was positioned throughout habitat types in the southern and western areas of the Decline Area (**Figure 5**). Habitat types associated with trap Line 2 comprised:

- Lower slope gullies and drainage lines with moderately dense *Triodia molesta* (pincushion spinifex) clumps and a sparse canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood);
- Slightly undulating plains with a sporadic canopy of *Eucalyptus leucophloia* (snappy gum) and *Corymbia terminalis* (western bloodwood) and a dominant groundcover of *Triodia molesta* (pincushion spinifex),
- Flat plains primarily dominated by *Aristida contorta* (bunched kerosene grass) and occasional *Triodia molesta* (pincushion spinifex) clumps on very stony soils

Each trap line was assessed using a standardised suite of assessment techniques (**TABLE I1**). All trap lines included the following features:

- 15 Elliot A (box) traps;
- 7 Hair tube funnels (Fauna tech);
- 5 Elliot B (box) traps;
- 2 Cage traps;
- Anabat echolocation; and
- Infra-red camera

Pitfall lines were installed at Trap line 2 consisted of five 20 litre buckets with 25 metres of drift fence. Trap line 1 did not contain an appropriate soil type to justify the installation of a pitfall trapping line.

Each Trap line was subject to dawn and dusk avifauna surveys carried out by a minimum of two ecologists sampling a 2 hectare area for 20 minutes to comply with the Birds Australia standardised guidelines for survey works. All species found during these surveys were noted, including the associated habitat type. Similarly, herpetological surveys were conducted daily within a 2 hectare area for 20 minutes along each trap line.

TABLE E1: SURVEY EFFORT SUMMARY

Method	Target Fauna	Unit	Total
Elliot type A traps	Terrestrial mammals, reptiles & amphibians	Trap night	90
Elliot type B traps	Terrestrial mammals & reptiles	Trap night	30
Cage traps	Terrestrial mammals & reptiles	Trap night	12
Pitfall traps (4 buckets; 20 metre drift)	Terrestrial mammals, reptiles & amphibians	Trap night	15
Ground hair tubes	Terrestrial mammals	Hair tube night	42
ANABAT Echolocation Surveys	Microchiropteran bats	Anabat nights (6 pm – 6 am)	6
Infra-red cameras	Mammals, reptiles, amphibians & avifauna	24 hrs	6
Active diurnal reptile and amphibian ground searches	Reptiles & amphibians	Person hours	4
Diurnal bird searches	Avifauna	Person hours	4
Nocturnal spotlighting	Mammals, reptiles, amphibians & avifauna	Person hours	6
Diurnal call playback	Avifauna	Person hours	3
Nocturnal call playback	Avifauna	Person hours	3

G1.5 Access Road Methodology

During the survey of the Access Road alignment, each change in habitat type was documented via DGPS and has been illustrated within **Figures 5A & 5B**. Survey efforts were focused on a 100 m wide corridor (50 m each side) along the extent of the Access Road alignment. A description of each habitat type and associated quality for fauna noted along the alignment can be found in **Table 9** and is also illustrated within **Figures 5A & 5B**.

G1.6 ML Methodology

PDG conducted habitat assessments of eighteen ML to investigate specific habitat values attributed to the topography, vegetative conditions and previous disturbance extents. Details outlining specific ML's are provided in **Mine Lease Areas**. These surveys involved both vehicular and foot traverses by two ecologists to inspect all habitat types across the ML. Aerial photography was also used to aid this assessment to allow an informed interpretation of habitats that are inaccessible by vehicle and foot.

G1.7 Survey Limitations

1. The survey consisted of a single assessment performed over a three day-three night period in September 2010. While efforts to compensate this limitation were undertaken, these being the identification and compilation of species data collected by databases from various times of the year, such a short sampling timeframe can only be considered a 'snapshot' assessment. As such it is unlikely that all the methods employed have allowed the detection of species that may utilise the area either seasonally (eg. migratory birds) or temporally (eg. nomadic birds or species with extremely large home ranges). Nor may it account for species which may have been in low numbers in response to seasonal/ecological factors and which may not have been detected. Such variations can only be accounted for by long term, detailed assessments of several years duration (eg. refer How 1998).
2. Identification of hair and scats to species level is often difficult unless it is a monotypic species. Often identification can only be to genus level or to a group of species within the same genus typically being those with similar morphological characteristics. While an expert was sought to identify hair and scat samples collected within the Investigation Area (Barbara Triggs), this limitation was still evident in the results (**Appendix H**).
3. Methodologies used during the study are also believed to have at times caused limitations to the study. The use of ultrasonic echolocation (ANABAT) call recording allows for the identification of microchiropteran bats whose calls are sufficiently different from other species. Similarly bat species that fly high above the forest canopy typically are not well represented within ultrasonic censuses of microbat fauna. Additionally some calls are distorted by the equipment, some bats have short, soft or varying calls and calls may be distorted by mist or rain. Therefore this technique often does not provide a clear representation of diversity or abundance. A bat call expert was sought (Glenn Hoye –**Appendix I**) to minimize any limitations in identification of recorded calls. Similarly, the use of infra-red camera to record still photographs can often produce images that may not reveal specific features of a species to identify it correctly.

Appendix H Weather Details

TABLE H1: SEPTEMBER WEATHER DETAILS

Date	Time	Temp Out	Hi Temp	Low Temp	Out Hum	Dew Pt.	Wind Speed	Wind Dir	Wind Run	Hi Speed	Hi Dir	Wind Chill	Heat Index	THW Index	THSW Index	Bar	Rain	Rain Rate	In Temp	In Hum	In Dew	In Heat	ET
1/09/2010	4:45 PM	32.5	32.6	32.1	37	15.9	4.8	NNE	1.21	19.3	NNE	32.5	32.8	32.8	40.7	1011.7	0	0	25.6	34	8.6	24.8	0
1/09/2010	11:45 PM	21.1	21.2	21.1	89	19.2	3.2	SE	0.8	9.7	SE	21.1	22.2	22.2	20.9	1014.8	0	0	21.8	64	14.7	21.8	0
2/09/2010	3:15 PM	33.4	33.4	33.1	32	14.4	4.8	SSW	1.21	12.9	SSW	33.4	33.3	33.3	37.2	1011	0	0	22.7	34	6	21.6	0
2/09/2010	7:00 AM	19	19.1	19	89	17.1	1.6	SE	0.4	6.4	SE	19	19.7	19.7	18.4	1014.2	0	0	21.3	67	14.9	21.2	0
3/09/2010	4:45 PM	34.8	34.9	34.7	27	13	8	NNE	2.01	17.7	NNW	34.8	34.3	34.3	42.1	1006.9	0	0	25.2	34	8.2	24.6	0
3/09/2010	7:15 AM	19.2	19.2	19.1	84	16.4	0	WSW	0	3.2	WSW	19.2	19.8	19.8	18.7	1012.1	0	0	23.9	61	16	24.5	0
1/10/2010	12:00 AM	19.3	19.5	19.3	20	-4.2	3.2	SSE	0.8	11.3	SE	19.3	16.5	16.5	14	1015.6	0	0	22.5	28	3.1	20.9	0.1
4/09/2010	8:00 AM	16.1	16.1	16	74	11.4	12.9	SW	3.22	24.1	WSW	15.3	15.8	15.1	15.8	1016.4	0	0	18.6	61	10.9	18.2	0.08
4/09/2010	12:15 AM	28.6	28.7	28.6	41	14	9.7	N	2.41	19.3	N	28.6	28.6	28.6	26.9	1008.4	0	0	19.8	50	9.1	19.1	0
5/09/2010	4:30 PM	21.9	22.3	21.9	46	9.8	11.3	S	2.82	22.5	S	21.9	21.1	21.1	23.1	1017.5	0	0	25.2	46	12.7	24.9	0
5/09/2010	6:45 AM	13.6	13.6	13.6	93	12.5	9.7	ESE	2.41	14.5	E	13	13.7	13.1	11.6	1018.8	0	0	20.4	54	10.8	19.9	0
6/09/2010	6:15 AM	11.4	11.5	11.4	72	6.6	4.8	SSE	1.21	11.3	S	11.4	11.1	11.1	9.3	1020.7	0	0	20.3	47	8.6	19.4	0
6/09/2010	5:15 PM	23.5	23.6	23.4	25	2.3	11.3	SE	2.82	24.1	ESE	23.5	22.3	22.3	24.9	1017.7	0	0	24.3	40	9.9	23.8	0
7/09/2010	5:30 PM	30.3	30.9	30.3	25	8.1	3.2	SE	0.8	9.7	SSE	30.3	28.8	28.8	32.4	1013.7	0	0	28	32	9.8	27.1	0
7/09/2010	6:30 AM	12.7	12.7	12.5	58	4.6	4.8	SSE	1.21	11.3	SE	12.7	11.9	11.9	9.8	1020.1	0	0	17.9	42	4.8	16.5	0
8/09/2010	4:30 PM	35.3	35.5	35.3	23	11.1	1.6	ESE	0.4	14.5	ESE	35.3	34.3	34.3	40.9	1012.2	0	0	25.8	31	7.4	24.9	0
8/09/2010	5:30 AM	17.9	17.9	17.8	56	9	0	SSE	0	1.6	SSE	17.9	17.2	17.2	15.3	1015.4	0	0	22.8	42	9.2	22.2	0
9/09/2010	3:00 PM	36.1	36.2	35.9	26	13.6	4.8	NW	1.21	17.7	NW	36.1	35.9	35.9	42.9	1009.4	0	0	26.1	32	8.1	25.2	0.66
9/09/2010	3:00 AM	21.7	21.7	21.6	61	13.8	0	---	0	0	---	21.7	21.4	21.4	19.7	1012.5	0	0	19.9	51	9.4	19.2	0.05
10/09/2010	2:45 PM	27.1	27.1	26.8	59	18.4	8	SSE	2.01	17.7	SSE	27.1	27.8	27.8	32	1012.7	0	0	29.4	39	14	29.4	0
10/09/2010	11:45 PM	20.3	20.6	20.3	73	15.3	1.6	S	0.4	9.7	S	20.3	20.8	20.8	19.2	1016.1	0	0	22.8	50	11.9	22.6	0
11/09/2010	4:00 PM	28.2	28.6	28.1	30	8.9	11.3	S	2.82	22.5	SSE	28.2	27.1	27.1	33.6	1014.2	0	0	25.2	32	7.3	24.5	0.56
11/09/2010	7:00 AM	16.6	16.6	16.6	71	11.3	9.7	SE	2.41	17.7	ESE	16.6	16.3	16.3	14.7	1016.9	0	0	20.8	54	11.2	20.2	0.05
12/09/2010	4:45 PM	33.5	33.8	33.5	19	6.7	8	S	2.01	19.3	SSE	33.5	31.6	31.6	37.7	1011.6	0	0	26.9	29	7.3	25.7	0
12/09/2010	6:45 AM	15.3	15.3	15.2	66	9	0	SSE	0	3.2	SSE	15.3	14.8	14.8	12.9	1016.2	0	0	19.5	45	7.2	18.4	0
13/09/2010	3:30 PM	36.2	37	36.2	22	11.1	8	W	2.01	16.1	SSW	36.2	35.1	35.1	41.3	1010.1	0	0	27	31	8.4	25.9	0
13/09/2010	6:45 AM	18.2	18.2	17.9	48	7	4.8	S	1.21	8	SSE	18.2	17.2	17.2	15.2	1014.3	0	0	21.5	40	7.3	20.1	0
14/09/2010	11:45 PM	21.6	21.9	21.6	39	7.1	9.7	S	2.41	19.3	SSE	21.6	20.2	20.2	18.2	1016.3	0	0	24.7	35	8.2	24.1	0
14/09/2010	2:00 PM	31.7	31.9	31.4	26	9.8	12.9	S	3.22	25.7	S	31.7	30.1	30.1	35.6	1013	0	0	25.8	32	7.9	25	0.76
15/09/2010	3:30 PM	27.8	27.9	27.5	19	2	12.9	SSE	3.22	24.1	SSE	27.6	26	25.8	31.7	1014.1	0	0	25.7	29	6.3	24.8	0
15/09/2010	7:00 AM	16.6	16.6	16.6	50	6.1	14.5	SSE	3.62	25.7	S	15.5	15.6	14.4	12.8	1018.2	0	0	21.6	38	6.6	20.1	0.1
16/09/2010	3:30 PM	28	28	27.5	24	5.5	11.3	SSE	2.82	22.5	SSE	28	26.6	26.6	30	1013.8	0	0	25.4	39	10.5	24.9	0
16/09/2010	7:00 AM	17.5	17.5	17.4	56	8.6	14.5	SSE	3.62	25.7	S	16.6	16.8	15.8	14.2	1018.7	0	0	19.7	44	7.1	18.6	0.08
17/09/2010	1:15 PM	19.2	19.5	19.2	60	11.2	14.5	SE	3.62	24.1	SE	18.4	18.8	18.1	21.4	1017.5	0	0	25.2	45	12.4	24.9	0
17/09/2010	7:45 AM	14.2	14.2	14.1	79	10.6	14.5	SSE	3.62	24.1	SE	12.6	14	12.4	12.2	1020.7	0	0	20.3	48	8.9	19.4	0
18/09/2010	2:15 PM	21.4	22.1	21.4	65	14.6	12.9	S	3.22	22.5	SSE	21.2	21.3	21.1	25.5	1011.8	0	0	24.7	56	15.4	24.9	0
18/09/2010	4:45 AM	13.7	13.7	13.7	90	12.1	9.7	SE	2.41	14.5	ESE	13.1	13.7	13.1	11.6	1015.1	0	0	17.6	54	8.1	16.8	0
19/09/2010	11:30 PM	11.3	11.3	11.2	94	10.3	11.3	S	2.82	25.7	SSE	10	11.4	10.2	8.7	1020.6	0	0	17.4	59	9.3	16.8	0
19/09/2010	12:15 AM	15.3	15.5	15.3	89	13.5	11.3	SSE	2.82	19.3	SSE	14.8	15.4	14.9	13.6	1015.6	0	0	20.8	62	13.3	20.6	0
20/09/2010	4:00 PM	19	19.1	18.6	59	10.8	12.9	SSW	3.22	27.4	SE	18.7	18.6	18.3	24.9	1018.5	0	0	23.9	46	11.6	23.8	0.46
20/09/2010	7:15 AM	10.3	10.3	10.3	95	9.6	9.7	S	2.41	17.7	S	9.1	10.6	9.3	8.3	1021	0	0	15.7	63	8.7	15.2	0
21/09/2010	4:15 PM	26.3	26.3	25.9	40	11.6	12.9	SSW	3.22	22.5	S	26.1	25.8	25.6	32.1	1016.6	0	0	26.3	41	12	25.8	0
21/09/2010	7:00 AM	12.2	12.2	11.9	89	10.4	4.8	SSE	1.21	9.7	SSE	12.2	12.2	12.2	10.6	1020.5	0	0	18.1	60	10.2	17.7	0.03
22/09/2010	3:30 PM	30.7	31	30	41	16	11.3	S	2.82	27.4	S	30.7	31.1	31.1	37.9	1013.5	0	0	23	34	6.3	22.1	0
22/09/2010	7:00 AM	16.9	16.9	16.8	70	11.4	4.8	SSE	1.21	11.3	SSE	16.9	16.7	16.7	15.6	1017.5	0	0	22.5	51	11.9	22.2	0.03
23/09/2010	3:45 PM	31.8	31.8	31	42	17.3	12.9	S	3.22	30.6	SE	31.8	32.8	32.8	40.4	1012.8	0	0	23.1	39	8.4	22.5	0
23/09/2010	5:30 AM	19.2	19.2	19.2	66	12.7	6.4	SSE	1.61	12.9	SSE	19.2	19.2	19.2	17.7	1015.2	0	0	21.8	50	10.9	21.2	0
24/09/2010	3:00 PM	32.4	32.5	32.1	38	16.2	8	SSE	2.01	20.9	S	32.4	32.8	32.8	38.9	1012.7	0	0	23.1	38	8	22.4	0.51
24/09/2010	5:30 AM	21.3	21.3	21.2	61	13.5	6.4	SSE	1.61	11.3	SE	21.3	21	21	19.3	1015.5	0	0	20.9	49	9.8	20	0
25/09/2010	4:00 PM	32	32	31.8	39	16.3	1.6	SSW	0.4	8	SSW	32	32.4	32.4	36.3	1011.6	0	0	24.4	40	10	23.9	0.3
25/09/2010	7:00 AM	20.8	20.8	20.8	73	15.8	3.2	SSE	0.8	11.3	SSE	20.8	21.2	21.2	19.9	1015.3	0	0	23.6	59	15.1	23.9	0.03
26/09/2010	5:00 PM	31	31.1	30.6	34	13.3	6.4	SW	1.61	14.5	SW	31	30.3	30.3	37.2	1011.1	0	0	23.5	33	6.3	22.7	0.33
26/09/2010	7:00 AM	19.6	19.6	19.4	53	9.7	4.8	SSE	1.21	14.5	SSE	19.6	18.9	18.9	17.3	1014.8	0	0	22.7	45	10.2	22.2	0.05
27/09/2010	3:15 PM	33.4	33.7	33.2	26	11.3	11.3	WSW	2.82	25.7	SW	33.4	32.4	32.4	38.9	1009.8	0	0	23.1	35	6.8	22.3	0
27/09/2010	6:45 AM	17	17	16.9	58	8.7	0	---	0	0	---	17	16.3	16.3	14.4	1014.1	0	0	19	46	7.1	17.9	0
28/09/2010	4:00 PM	33.5	33.5	33.2	14	2.3	4.8	SSW	1.21	16.1	SW	33.5	31.3	31.3	37.3	1009.7	0	0	27	32	8.9	26	0.61
28/09/2010	6:45 AM	17.3	17.6	17.2	42	4.3	0	S	0	1.6	S	17.3	15.9	15.9	13.9	1013.1	0	0	20.9	38	6.1	19.4	0
29/09/2010	3:00 PM	30.1	30.1	29.7	18	3.1	17.7	SSE	4.43	29	ESE	29.5	28.2	27.7	32.6	1012.4	0	0	24.1	33	6.8	23.3	0.81
29/09/2010	5:30 AM	17.3	17.3	17.1	40	3.6	0	S	0	3.2	S	17.3	15.8	1									

TABLE H1: SEPTEMBER WEATHER DETAILS

30/09/2010	3:30 PM	28.4	28.9	28.4	9	-7.5	11.3	SE	2.82	24.1	S	28.4	26.3	26.3	32	1013.2	0	0	28.2	23	5.1	26.7	0
30/09/2010	6:45 AM	15.6	15.6	15.6	49	4.9	4.8	SE	1.21	9.7	SSE	15.6	14.4	14.4	12.5	1016.6	0	0	20.7	36	5.1	19.1	0

Appendix I Fauna List from Survey

TABLE I1: FAUNA SPECIES LIST 15-22 SEPTEMBER 2010

Species Name	Common Name	Method of Detection	Source		Status	
			D	A	C'with	Old
Amphibians						
Total amphibians		0 Families, 0 Species				
Reptiles						
Agamidae						
<i>Amphibolurus gilberti</i>	Gilbert's dragon	obs		X		
<i>Ctenophorus caudicinctus*</i>	ring-tailed dragon	obs	X	X		
<i>Ctenophorus isolepis*</i>	central military dragon	obs	X			
<i>Diporiphora magna*</i>	yellow-sided two-lined dragon	obs	X			
<i>Diporiphora winneckeii</i>	canegrass two-lined dragon	obs	X			
Elapidae						
<i>Pseudonaja nuchalis*</i>	western brown snake	obs	X			
<i>Pseudonaja textilis</i>	eastern brown snake	obs		X		
Varanidae						
<i>Varanus giganteus*</i>	perentie	obs		X		
Total reptiles		3 Families, 8 Species				
Birds						
Acanthizinae						
<i>Smicronis brevirostris</i>	weebill	obs	X			
Accipitridae						
<i>Aquila audax</i>	wedgetail eagle	obs	X	X		
<i>Circus assimilis</i>	spotted harrier	obs		X		
<i>Milvus migrans</i>	black kite	obs	X	X		
<i>Lophoictinia isura</i>	square-tailed kite	obs	X			NT
Aegothelidae						
<i>Aegotheles cristatus</i>	Australian owllet-nightjar	obs	X	X		
Alcedinidae						
<i>Halcyon pyrrhopygia</i>	red-backed kingfisher	obs		X		
<i>Halcyon sancta</i>	sacred kingfisher	obs		X		
Anatidae						
<i>Chenonetta jubata</i>	Australia wood duck	obs		X		
Ardeidae						
<i>Ardea pacifica</i>	white-necked heron	obs		X		
<i>Egretta alba</i>	great egret	obs		X	M	
<i>Egretta novaehollandiae</i>	white-faced heron	obs		X		
<i>Nycticorax caledonicus</i>	nankeen night-heron	obs		X		
Artamidae						
<i>Artamus cinereus</i>	black-faced woodswallow	obs	X	X		
<i>Artamus cyanopterus</i>	dusky woodswallow	obs	X	X		

Species Name	Common Name	Method of Detection	Source		Status	
			D	A	C'with	Qld
<i>Artamus leucorhynchus</i>	white-breasted woodswallow	obs	X	X		
<i>Artamus minor</i>	little woodswallow	obs	X	X		
<i>Artamus personatus</i>	masked woodswallow	obs	X	X		
<i>Cracticus nigrogularis</i>	piebald butcherbird	obs	X	X		
<i>Cracticus tibicen</i>	Australian magpie	obs	X	X		
<i>Cracticus torquatus</i>	grey butcherbird	call/obs	X	X		
Cacatuidae						
<i>Cacatua galerita</i>	sulphur-crested cockatoo	call/obs		X		
<i>Cacatua sanguinea</i>	little corella	call/obs	X	X		
<i>Eolophus roseicapilla</i>	galah	call/obs	X	X		
Campephagidae						
<i>Coracina maxima</i>	ground cuckoo-shrike	obs		X		
<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike	call/obs	X	X		
Caprimulgidae						
<i>Eurostopodus argus</i>	spotted nightjar	obs	X	X		
Charadriidae						
<i>Charadrius melanops</i>	black-fronted dotterel	obs		X		
Columbidae						
<i>Geopelia cuneata</i>	diamond dove	obs	X	X		
<i>Geopelia striata</i>	peaceful dove	obs	X	X		
<i>Geophaps plumifera</i>	spinifex pigeon	obs	X	X		
<i>Ocyphaps lophotes</i>	crested pigeon	obs	X	X		
<i>Phaps chalcoptera</i>	common bronzewing pigeon	obs	X	X		
<i>Phaps histrionica</i>	flock bronze-wing	obs	X	X		
Corcoracidae						
<i>Struthidea cinerea</i>	apostlebird	call/obs		X		
Corvidae						
<i>Corvus coronoides</i>	Australia raven	call/obs	X	X		
<i>Corvus orru</i>	Torresian crow	call/obs	X	X		
Dicruridae						
<i>Grallina cyanoleuca</i>	magpie-lark	call/obs	X	X		
<i>Rhipidura leucophrys</i>	willie wagtail	obs	X	X		
Estrildidae						
<i>Emblema pictum</i>	painted finch	obs	X	X		
<i>Taeniopygia guttata</i>	zebra finch	call/obs	X	X		
Falconidae						
<i>Falco berigora</i>	brown falcon	obs	X	X		
<i>Falco hypoleucos</i>	grey falcon	obs	X			NT
<i>Falco longipennis</i>	Australian hobby	obs	X	X		
<i>Falco peregrinus</i>	peregrine falcon	obs	X			
Maluridae						
<i>Amytornis purnelli ballarae</i>	kalkadoon grasswren	obs	X			
<i>Malurus leucopterus</i>	white-winged fairy-wren	obs	X			
<i>Malurus lamberti</i>	variegated fairy-wren	obs	X			

Species Name	Common Name	Method of Detection	Source		Status	
			D	A	C'with	Qld
<i>Stipiturus ruficeps</i>	rufous-crowned emu-wren	obs	X			
Meliphagidae						
<i>Epthianura crocea</i>	yellow chat	obs		X		
<i>Lichenostomus keartlandi</i>	grey-headed honeyeater	obs	X	X		
<i>Lichenostomus penicillatus</i>	white-plumed honeyeater	obs		X		
<i>Lichenostomus virescens</i>	singing honeyeater	obs		X		
<i>Lichmera indistincta</i>	brown honeyeater	obs	X	X		
<i>Manorina flavigula</i>	yellow-throated miner	obs		X		
<i>Manorina melanocephala</i>	noisy minor	obs	X			
<i>Philemon citreogularis</i>	little friarbird	obs	X	X		
Meropidae						
<i>Merops ornatus</i>	rainbow bee-eater	obs	X	X	M	
Motacillidae						
<i>Anthus novaeseelandiae</i>	Richard's pipit	obs		X		
Otididae						
<i>Ardeotis australis</i>	Australian bustard	obs		X		
Pachycephalidae						
<i>Oreoica gutturalis</i>	crested bellbird	obs	X	X		
Petroicidae						
<i>Melanodryas cucullata</i>	hooded robin	obs	X			
<i>Microeca fascinans</i>	Jacky winter	obs	X	X		
Phalacrocoracidae						
<i>Anhinga melanogaster</i>	dartar	obs		X		
<i>Phalacrocorax melanoleucos</i>	little pied cormorant	obs		X		
<i>Phalacrocorax sulcirostris</i>	little black cormorant	obs		X		
Phasianidae						
<i>Coturnix ypsilophora</i>	brown quail	obs	X	X		
Pomatostomidae						
<i>Pomatostomus temporalis</i>	grey-crowned babbler	obs		X		
Psittacidae						
<i>Aprosmictus erythropterus</i>	red-winged parrot			X		
<i>Barnardiua zonarius (Macgillivrayi)</i>	Australian ringneck parrot	obs	X			
<i>Melopsittacus undulatus</i>	budgerigar	call/obs		X		
Sylviidae						
<i>Eremiornis carteri</i>	spinifexbird	obs	X	X		
Total birds 29 Families, 72 Species						
Mammals						
Bovinae						
<i>bos taurus</i>	cattle	obs		X		
Emballonuridae						

Species Name	Common Name	Method of Detection	Source		Status	
			D	A	C'with	Qld
<i>Saccolaimus flaviventris</i>	yellow-bellied sheathtail bat	anabat	X			
<i>Taphozous troughtoni</i> [#]	Troughton's sheathtail bat	anabat	X		E	
<i>Taphozous georgianus</i> [#]	common sheathtail bat	photograph		X		
Felidae						
<i>Felis catus</i>	feral cat	IR camera	X			
Macropodidae						
<i>Macropus rufus</i> [†]	red kangaroo	scats / obs		X		
<i>Macropus robustus</i>	comon wallaroo	obs	X			
<i>Macropus giganteus</i>	eastern grey kangaroo	obs	X			
<i>Onychogalea unguifera</i> [†]	northern nailtail wallaby	scats				
<i>Petrogale purpureicollis</i> [†]	purple-necked rock-wallaby	scats / obs		X		V
Molossidae						
<i>Chaerephon jobensis</i> [#]	northern freetail bat	anabat	X			
Muridae						
<i>Mus musculus</i> ^{o†}	house mouse	capture	X	X		
<i>Rattus rattus</i> ^o	black rat	capture		X		
<i>Zyomys argurus</i> ^o	common rock-rat	capture	X			
Tachyglossus						
<i>Tachyglossus aculeatus</i> [†]	short-beaked echidna	scats	X	X		
Vespertilionidae						
<i>Chalinolobus gouldii</i>	Gould's wattled bat	anabat		X		
<i>Nyctophilus sp</i> [#]	unidentified long-eared bat	anabat	X			
<i>Vespadelus finlaysoni</i> [#]	inland cave bat	anabat	X	X		
Total mammals	8 Families, 18 Species					

KEY

Species Name:

- * Species identified using photographic evidence (not keyed out in the field)
- o Species captured and keyed out in the field using Cogger (1996) and Strahan (1995)
- ^ Species identified using indirect field observations
- † Species identified as probable or possible by scat and hair analysis expert Barbara Triggs (see **APPENDIX X** for report)
- # Species identified as probable or possible by bat expert Glenn Hoye (see **APPENDIX X** for report)

Source:

- D** species detected in the Decline Area
- A** species detected within other Mine Lease Areas

Status:

- Commonwealth** endangered (**E**), vulnerable (**V**), rare (**R**) and migratory (**M**), according to the *Environment Protection and Biodiversity Conservation Act 1999*.
- State (Queensland)** endangered (**E**), vulnerable (**V**) and near threatened (**NT**), according to the *Nature Conservation (Wildlife) Regulation 2006*.

Appendix J B. Triggs Results

TABLE J1: SCAT SURVEY

No.	Date	Location	Scat	Mammal ID - definite	Mammal ID - probable
1	16/9/2010	Merlyn Decline	macropod	<i>Macropus rufus</i>	
2	17/9/2010	Lower slope T1, T8	macropod	<i>M. rufus</i>	
3	17/9/2010	Decline area TL1 rocky slope	macropod	<i>M. rufus</i>	
4	17/9/2010	East Escarpment Trap 2 TL1	macropod	<i>M. rufus</i>	
5	17/9/2010	Top of East Escarpment	echidna	<i>Tachyglossus aculeatus</i>	
6	17/9/2010	Rock pile	macropod	<i>Petrogale sp.</i>	<i>P. purpureicollis</i>
7	17/9/2010	Gibber Plain, south-west	macropod	<i>M. rufus</i>	
8	18/9/2010	Gibber Plain	macropod	<i>M. rufus</i>	
9	18/9/2010	Decline area	macropod	<i>Macropus sp.</i>	<i>M. rufus</i>
10	18/9/2010	Decline area, rock face	macropod	<i>Macropus sp.</i>	<i>M. rufus</i>
11	18/9/2010	Decline area	macropod	<i>M. rufus</i>	
12	18/9/2010	Rocky outcrop	macropod	<i>M. rufus</i>	
13	18/9/2010	Mt Cobalt	macropod	<i>M. rufus</i>	
14	18/9/2010	Selwyn 2	invertebrate	insect larvae	
15	19/9/2010	Selwyn 3	macropods	1. <i>M. rufus</i> 2. <i>Petrogale sp.</i>	3. <i>Onychogalea unguifera</i>
16	19/9/2010	Victoria Nth	invertebrate	insect larvae	
17	19/9/2010	Victoria Nth	macropod	<i>M. rufus</i>	
18	19/9/2010	Victoria Dam	macropod	<i>M. rufus</i>	
19	no date	Haul Rd	lumps of mud		
20	no date	Mt Elliot	echidna	<i>T. aculeatus</i>	
21	no date	Incidental - rocky outcrop	invertebrate	insect larvae	
22	no date	Incidental	macropod	<i>M. rufus</i>	
23	no date	Capture (with bait)	rodent		<i>Mus musculus</i>

Appendix K G. Hoyer Results

Appendix L Fauna Species of Conservation Significance

L1 – FAUNA SPECIES OF CONSERVATION SIGNIFICANCE

Name	Common Name	Status		Habitat	Likely Presence	Notes
		C'wth	Qld			
Reptiles						
<i>Acanthopis antarcticus</i>	common death adder		NT	Found in a wide variety of habitats, in association with deep leaf litter. Habitats include rainforests, wet sclerophyll, woodland, grasslands, chenopod dominated shrublands and coastal heathlands.	Confirmed within Investigation Area	Once abundant in many areas; however has experienced a dramatic reduction in numbers. Threatened by habitat loss due to land clearing, grazing, removal of woody debris and rocks that provide refuge, feral animals and cane toad poisoning. Inappropriate fire regimes may pose additional threats. Confirmed in nearby localities, and is likely to utilise a range of habitats throughout the Investigation Area, including rocky escarpments, steep foothills, riparian channels, incised drainage lines and flatter plains.
Birds						
<i>Falco hypoleucos</i>	grey falcon		NT	Wooded watercourses of arid and semi-arid regions and shrub/grasslands west of the great dividing range, however sometimes found in coastal woodlands.	Confirmed within Investigation Area	Approaching the northern limits of its range in the Mount Isa region (Marchant & Higgins 1993). Horton (1975) notes four records from the Mount Isa district (two on an unnamed creek and two on the Leichhardt River). Confirmed within the Investigation Area during recent surveys. Likely to forage over the majority of the Investigation Area, however nesting habitat is predominately restricted to large canopy vegetation associated with riparian channels and steep foothills.
<i>Melithreptus laetior</i>	black-chinned honeyeater		NT	Open savannah – dry sclerophyll forests with <i>Banksia</i> and <i>Callitis</i> spp understorey.	Likely Confirmed in nearby locality	Has two subspecies, with <i>Laetior</i> formerly considered a separate species (golden-backed honeyeater). This species is found in north-western Australia from central QLD to WA (Pilbara). The species is gregarious and usually observed in pairs and small groups up to 12 individuals. Their large feeding home-ranges, which search for insects, nectar and honeydew, makes this species locally nomadic. Wildlife Online Database (EPA 2008) records do not indicate the Black-chinned honeyeater in this locality, and there are no records of this species in the Birds Australia data. PLACE (2006) considered this species a possible occurrence in the Trekelano lease area to the north, however did not document this species during surveys. Confirmed in nearby localities, and is likely to utilise small portions of the Investigation Area as part of its larger home-range. Higher quality habitat will be predominately limited to areas containing forage resources such as <i>Eucalyptus camaldulensis</i> (river redgum) associated with riparian channels.

Name	Common Name	Status		Habitat	Likely Presence	Notes	
		C'with	Qld				
<i>Lophoictinia isura</i>	square-tailed kite			NT	Dry open forest, woodland, grassland	Confirmed within Investigation Area	<p>Preferred habitat is a variety of timbered habitats, including dry woodlands and open forests. In particular, this species shows a preference towards areas containing watercourses. The species is a specialist hunter of passerines and insects. The <i>Lophoictinia isura</i> (square-tailed kite) is likely to forage over the majority of the Investigation Area; however nesting habitat is predominately restricted to large canopy vegetation associated with riparian channels and steep foothills.</p> <p>Due to their very large home-ranges which can be up to 100 km² (DEC 2005), the Investigation Area appears unlikely to provide critical habitat that is not otherwise common in the region. Square-tailed kites were confirmed to forage within the Investigation Area during recent surveys.</p>
<i>Heteromunia pectoralis</i>	pectorella mannikin			NT	Open country, grass flat associated with creeks beds	Likely Confirmed in nearby localities	<p>Inhabits open country with sparse scattering of trees, groundcover of grass or Spinifex and grassy flats along creeks (Morcombe, 2004). Is better adapted to arid regions than other manikins. This species is nomadic and will visit water daily even if they must travel distances to do so. The majority of sightings of this species during recent fauna surveys (PDG 2010) occurred within the Mort River Corridor.</p> <p>Confirmed in nearby localities, and is therefore considered likely to utilise habitats throughout the Investigation Area. Scattered canopy trees and groundcovers of <i>Triodia molesta</i> (pincushion spinifex) and other grasses, associated with flatter plains and riparian channels throughout the Investigation Area, are likely to provide movement or forage habitat for the <i>Heteromunia pectoralis</i> (pectorella manikin).</p>
<i>Pezoporus occidentalis</i>	night parrot	E	E		Arid areas with low vegetation (Spinifex and hummock grasslands)	Unlikely	Relies on habitats containing dense Spinifex clumps and ground cover. Following dusk, this species drinks and then feed amongst Spinifex. The Protected Matters Search Tool lists the Night parrot as a potential occurrence in the locality, although there are no actual records of this species in the Wildlife Online Database (EPA 2008) or Birds Australia Atlas. Using a range of techniques, Maher (1995) conducted detailed surveys for the Night Parrot (without success) in the Winton and Cloncurry districts.
<i>Rostratula australis</i>	Australian painted snipe	V	V		Wetlands, waterways, dams and marshy areas	Unlikely	Very secretive species that prefers shallow wetland habitat surrounded by dense lowland vegetation. The Protected Matters Search Tool lists this species as a potential occurrence in the locality, although there are no records of this species in the Wildlife Online Database (EPA 2008) or Birds Australia Atlas.

Name	Common Name	Status		Habitat	Likely Presence	Notes
		C'with	Qld			
Mammals						
<i>Petrogale purpureicollis</i>	purple-necked rock-wallaby		V	Rocky outcrops cliffs and gorges in arid conditions (far north western QLD)	Confirmed within Investigation Area	<p>The Purple-necked rock-wallaby (now considered a distinct species of the Petrogale genus) occurs in north-western Queensland from Dajarra and west of Mount Isa to the eastern end of the Selwyn Ranges, north to Lawn Hill and possibly into the Northern Territory (Eldridge & Close 1995).</p> <p>Confirmed within the Investigation Area during recent surveys in natural rocky escarpments (scat analysis) and in waist rock piles caused by mining overburden.</p>
<i>Sminthopsis douglasi</i>	Julia creek dunnart	E	E	Grassland areas associated with the Mitchell Downs areas surrounding Julia Creek	Unlikely	<p>Little is known about the habitat requirements for this species however only 11 populations have been found throughout QLD. All populations occur within 100km of Julia Creek (the Site is 250km south west of Julia Creek).</p> <p>The Protected Matters Search Tool lists the Julia Creek Dunnart (<i>Sminthopsis douglasi</i>) as a potential occurrence in the locality, although there are no actual records of this species in the Wildlife Online Database (EPA 2006). The species' preferred Mitchell grass downs habitats are characterised by predominantly grass-covered cracking clay soils of two types (ashy and stony). There is typically a new growth of grasses following the summer rain and the ground swells and then cracks as the soil dries out. No specific habitat requirements or correlations have been detected for the species within its known range. It is found on both soil types in areas of sparse and dense ground cover and in areas where no cracks or holes remained in the ground. The Julia creek dunnart may shelter in cracks in the ground when the soil is dry and ground cover is sparse, and in vegetation when the cracks and holes close up after rain and the vegetation sprouts (Woolley 1998).</p> <p>No suitable cracking clay habitat was observed throughout the Investigation Area.</p>

Name	Common Name	Status		Habitat	Likely Presence	Notes
		C'with	Qld			
<i>Taphozous troughtoni</i>	Troughton's sheath-tail bat	E		Wet and dry sclerophyll forests, open woodland, mulga shrublands, Spinifex covered hills, and grasslands. Requires rocky areas containing roosting caves and crevices.	Confirmed within Investigation Area	<p>This species is endemic to Australia. Its distribution is poorly understood, but the species is known to occur in the Mt Isa region, ranging well into central and south-east Queensland.</p> <p>The species requires caves and crevices for roosting habitat, however has been found to utilise old mining structures.</p> <p>Although listed as critically endangered (EPBC Act), both State and Commonwealth database searches for the locality do not list this species as potentially occurring.</p> <p>Confirmed within the Investigation Area during recent ANABAT echolocation surveys (expert Glenn Hoyer). Also, identified as potentially roosting in old mining structures (Smelting plant – Mount Elliot ML) from photographic evidence. This species is likely to forage over a range of habitats throughout the Investigation Area, as well as roost in caves and crevices in rocky escarpment areas.</p>
<i>Mactoderma gigas</i>	ghost bat		V	Arid Spinifex hillsides, open savannah, woodland, tall open woodland and tropical forests	Possible	<p>This species roosts deep in caves and abandoned mine shafts. The Investigation Area is located outside of the ghost bat's known range (Van Dyck and Strahan 2008), however does support the large deep caves and mining structures/shafts used as maternity roosts by females during the wet season or as more permanent sites by this species in general. Rock overhangs, shallow caves, rock clefts and cracks (used as temporary roosts by this species) occur along ridgelines throughout the Investigation Area.</p>