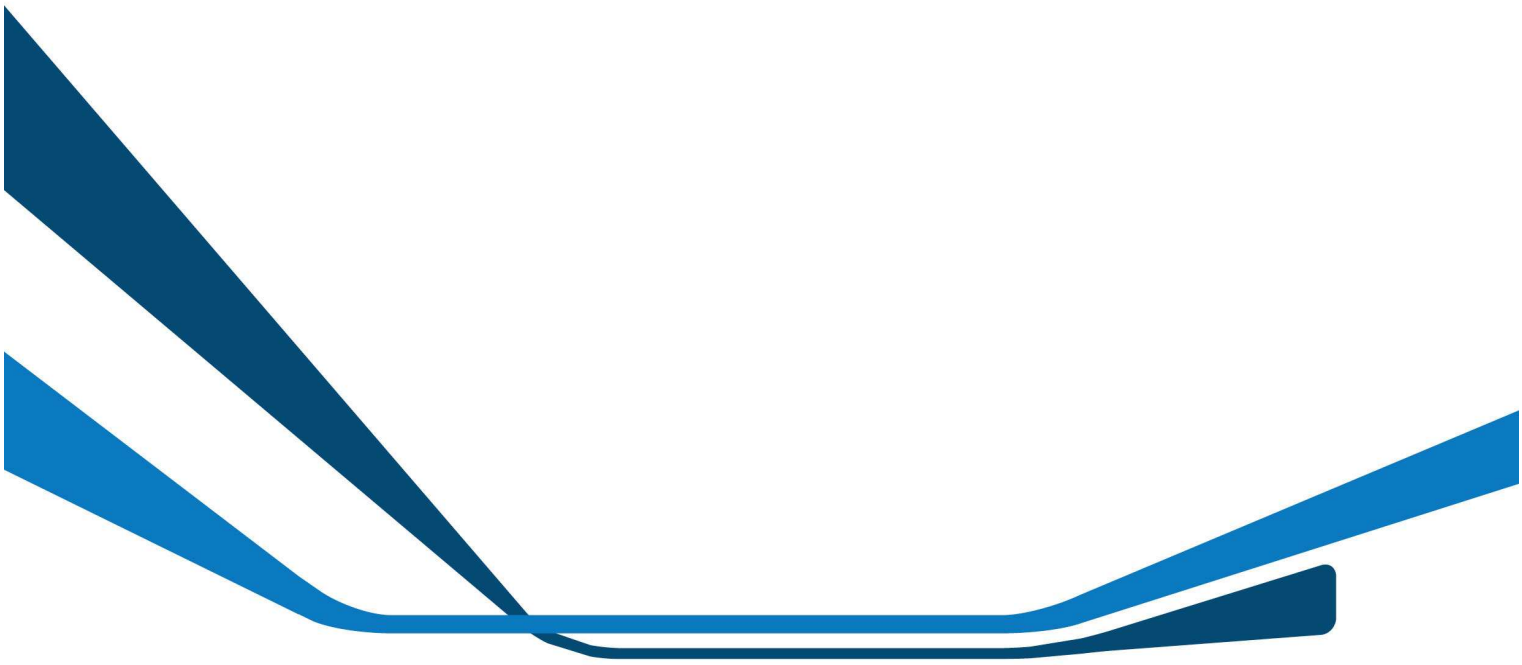
Waratah Coal

China First Project

Mine site terrestrial flora and fauna assessment

WAR003-ENV-RPT-0001



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Rev	Description	Originator	Reviewed	Approved	Date
A	Issued for Internal Review	SM	SF	SF	06 AUG 10
B	Draft Issued for Client Review	SM	SF	SF	09 AUG 10
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Definitions and abbreviations

Definitions

Critically Endangered	Designated as 'Critically Endangered' under the EPBC Act. Refer to definition of 'EPBC Act conservation status' for meaning of Critically Endangered under the Act
Ecological Community	An assemblage of species occupying a particular area
Endangered	Designated as 'Endangered' under the EPBC Act, NC Act and / or VM Act. Refer to definitions of 'EPBC Act conservation status', 'NC Act conservation status' and 'VM Act conservation status' for meaning of Endangered under each Act
EPBC Act conservation status	Under the EPBC Act, listed threatened species and ecological communities are assigned a conservation status of 'extinct in the wild', 'Critically Endangered', 'Endangered' or 'Vulnerable'. Definitions of these terms under the EPBC Act areas follows: Extinct in the wild • it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range or • it has not been recorded in its known and / or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form. Critically Endangered • it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria. Endangered • it is not Critically Endangered and • it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria. Vulnerable • it is not Critically Endangered or Endangered and • it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Habitat	An area or areas permanently, periodically or occasionally occupied by a species, population or ecological community, including any and all biotic and abiotic features of the area or areas occupied
Least Concern	Designated as 'Least Concern' under the VM Act. Refer to definition of 'VM Act status' for meaning of 'Least Concern' under the Act.
Migratory species	Species listed as 'Migratory' under the EPBC Act
Mine footprint	Area to be cleared for mining activities as shown in **Figure 1**

Mine surface clearance footprint	Same as 'Mine footprint'. Area to be cleared for mining activities as shown in **Figure 1**
NC Act conservation status	Under the NC Act, protected species are assigned a conservation status of 'Extinct in the wild', 'Endangered', 'Vulnerable', 'Near Threatened', or 'Least Concern'. Definitions of these terms under the NC Act are as follows: Extinct in the wild • there have been thorough searches conducted for the wildlife and • it has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife. Endangered • there have not been thorough searches conducted for the wildlife and the wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife or • the habitat or distribution of the wildlife has been reduced to an extent that the wildlife may be in danger of extinction or • the population size of the wildlife has declined, or is likely to decline, to an extent that the wildlife may be in danger of extinction or • the survival of the wildlife in the wild is unlikely if a threatening process continues. Vulnerable • its population is decreasing because of threatening processes or • its population has been seriously depleted and its protection is not secured or • its population, while abundant, is at risk because of threatening processes or • its population is low or localised or depends on limited habitat that is at risk because of threatening processes. Near Threatened • the population size or distribution of the wildlife is small and may become smaller or • the population size of the wildlife has declined, or is likely to decline, at a • rate higher than the usual rate for population changes for the wildlife or • the survival of the wildlife in the wild is affected to an extent that the wildlife is in danger of becoming vulnerable. Least Concern • the wildlife is common or abundant and is likely to survive in the wild.

	Native wildlife may be prescribed as Least Concern wildlife even if: • the wildlife is the subject of a threatening process or the population size or distribution of the wildlife has declined or • there is insufficient information about the wildlife to conclude whether the wildlife is common or abundant or likely to survive in the wild.
Near Threatened	Designated as 'Near Threatened' under the NC Act. Refer to definition of 'NC Act conservation status' for meaning of Near threatened under the NC Act.
Non-remnant vegetation	Vegetation that is not mapped as remnant vegetation by DERM and / or which fails to meet DERM's criteria for 'remnant vegetation' (see definition of 'remnant vegetation', below). This includes regrowth, heavily thinned or logged vegetation and significantly disturbed vegetation that fails to meet the structural and / or floristic characteristics of remnant vegetation. It also includes urban and cropping land. Non-remnant vegetation may retain significant biodiversity values (Neldner *et al.* 2005).
Regional Ecosystem	A vegetation community, within a bioregion, that is consistently associated with a particular combination of geology, landform and soil. REs may be classified under schedules 1–3 of the *Vegetation Management Regulation 2000* as either Endangered, Of Concern or Least Concern. Refer to 'VM Act conservation status' for meaning of Endangered, Of Concern or Least Concern under the VC Act.
Regionally Significant	Refer to taxa not listed as Threatened or Near Threatened species under the EPBC Act and / or NC Act, but have been listed as non-threatened priority taxa for the Desert Uplands bioregion.
Remnant vegetation	Remnant woody vegetation is defined as vegetation where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed heightand cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy (Neldner *et al.* 2005).
Threatened	A term used for: • flora and fauna species which have been designated as Extinct in the wild, Endangered or Vulnerable under the NC Act; • flora and fauna species which have been designated as Extinct in the wild, Endangered or Vulnerable under the EPBC Act; • Ecological Communities designated as Critically Endangered, Endangered or Vulnerable under the EPBC Act; and / or • REs designated as Endangered or Of Concern under the VM Act.

VM Act conservation status	Under the VM Act, REs may be classified as either 'Endangered', 'Of Concern' or 'Least Concern'. Definitions of these terms under the VM Act are provided below. Endangered • less than 10% of pre-clearing extent of remnant vegetation (see following definition) exists in the bioregion, or 10 to 30 % of pre-clearing extent remains and the remnant vegetation is less than 10 000 hectares. In addition, for biodiversity planning purposes DERM also classifies a regional ecosystem as Endangered if: • less than 10% of its pre-clearing extent remains unaffected by severe degradation and / or biodiversity loss or • 10-30% of its pre-clearing extent remains unaffected by severe degradation and / or biodiversity loss and the remnant vegetation is less than 10,000 hectares; or it is a rare regional ecosystem subject to a threatening process. Of Concern • 10 to 30% of pre-clearing extent of remnant vegetation exists in the bioregion, or more than 30% of pre-clearing extent remains and the remnant vegetation is less than 10 000 hectares. In addition, for biodiversity planning purposes DERM also classifies a regional ecosystem as Of Concern if: • 10-30% of its pre-clearing extent remains unaffected by moderate degradation and / or biodiversity loss. Least Concern • more than 30% of pre-clearing extent of remnant vegetation exists in the bioregion, and it is greater than 10, 000 hectares. In addition, for biodiversity planning purposes DERM also classifies a regional ecosystem as Least Concern if the degradation criteria listed above for Endangered or Of Concern regional ecosystems are not met.
Vulnerable	Designated as 'Vulnerable' under the EPBC Act and / or NC Act. Refer to definitions of 'EPBC Act conservation status' and 'NC Act conservation status' for meaning of 'Vulnerable' under these Acts.

Abbreviations

Abbreviations	Meaning
ANRA	Australian Natural Resources Atlas
BAMM	Biodiversity Assessment and Mapping Methodology
BPA	Biodiversity Planning Assessment
CE	Critically Endangered
Cm	Centimetre
CORVEG	Queensland Herbarium's site-based floristic dataset
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CV	Curriculum Vitae
DERM	The Department of Environment and Resource Management
DEU	Desert Uplands
DEWHA	The Department of the Environment, Water, Heritage and the Arts
DNR	Department of Natural Resouces
DNRW	Department of Natural Resources and Water
E	Endangered
e.g.	Latin for exempli gratia (for example)
EHA	Queensland Essential Habitat mapping
EIS	Environmental Impact Statement
EP Act	*Environmental Protection Act 1994*
EPA	Environmental Protection Agency
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Areas
ESD	Ecological Sustainable Development
et al.	Latin for `et alii' (masculine plural) or `et aliae' (feminine plural) or `et alia' (neuter plural) (and others)
GDA	Geocentric Datum of Australia
GPS	Global positioning system
Ha	Hectare
Hrs	Hours
i.e.	Latin for id est (that is)
kHz	Kilohertz
Km	Kilometre
km^2	kilometre square
Lat.	Latitude

LC	Least Concern
Long.	Longitude
LP Act	Queensland *Land Protection (Pest and Stock Route Management) Act 2002*
M	Meter
m^2	meter square
Mi	Migratory
MNES	Matters of National Environmental Significance
n / a	not applicable or not available
NC Act	Queensland *Nature Conservation Act 1992*
NOC	No Concern at Present
NT	Near Threatened
OC	Of Concern
pers. comm.	personal communication
QEPA	former Queensland Environmental Protection Agency
QGEOP	Queensland Government Environmental Offsets Policy
Qld	Queensland
QM	Queensland Museum
RE	Regional Ecosystem
RM Act	*Regrowth Moratorium Act 2009*
ROTAP	CSIRO Rare or Threatened Australian Plants List
SDPWO Act	The Queensland *State Development and Public Works Organisation Act 1971*
SP Act	The Queensland *Sustainable Planning Act 2009*
sp.	species (singular)
spp.	species (plural)
Sq	square kilometre
subsp.	Subspecies
TOR	Terms of Reference
V	Vulnerable
var.	Variety
VM Act	Queensland *Vegetation Management Act 1999*
WONS	Weeds of National Significance

EXECUTIVE SUMMARY

Unidel Group was commissioned by Waratah Coal Pty Ltd to undertake a terrestrial flora and fauna assessment for the proposed mine site for the China First Project.

The proposed mine site is located approximately 35 km north west of Alpha in central western Queensland and is wholly situated in the Desert Uplands bioregion.

Desktop and field studies were used to identify, describe and assess key flora and fauna values of the study area and potential impacts associated with both the construction and operation of the mine.

A total of 31 flora sites and 8 fauna sites were ground truthed. These sites were distributed within four habitat areas representing three different habitat types occurring within the study area (i.e. open woodland, riverine and Buffel Grass, *Pennisetum ciliare*, pasture).

Fauna trapping using various techniques (i.e. pitfall traps, Elliott traps, funnel traps, bat traps and ultrasonic recording, spotlighting and bird transects) were conducted over a total of 20 days in October 2009 and April 2010.

Existing Environment

Flora Environment

The dominant land use across the proposed mine site is cattle grazing. A significant portion of the site is cleared of standing timber for cattle pastures. These areas are dominated by Buffel Grass, which is well established on rough, blade ploughed terrain on low, undulating hills and plains.

Part of the mine surface clearance footprint occurs in the north and eastern parts of the Bimblebox Nature Refuge, an area gazetted under the *Nature Conservation (Protected Areas) Regulation 1994.* This area is classified as a Category C Environmentally Sensitive Area under DERM ESA mapping. The EPA (2005) identifies the site as containing 'Special biodiversity values' and 'Wildlife refugia' and is mapped as being of Local Significance.

The DERM RE mapping identifies 21 REs as occurring within the study area, including 9 which occur within the mine surface clearance footprint.

Most remnant vegetation within the study area and all within the mine surface clearance footprint is listed as Least Concern under the *Vegetation Management Act 1999* and these communities do not form part of any threatened ecological community identified under the *Environment Protection and Biodiversity Conservation Act 1999*.

Database searches identified three flora species listed under the *Nature Conservation Act 1992* (NC Act) that are known to have ranges that overlap the wider study area. Five populations of Large-podded Tick-trefoil (*Desmodium macrocarpum*) have been previously recorded by WorleyParsons (2009) and the present field survey was unable to confirm the potential extent of this species beyond these locations due to unfavourable seasonal conditions.

A total of 85 Least Concern native flora species were recorded during the field surveys. Additionally eight non native flora species were identified within the study area including three declared Class 2 weed species (Rubber Vine, *Cryptostegia grandiflora*; Velvet Tree Pear, *Opuntia tomentosa*; and Arsenic Weed, *Senna obtusifolia*).

Fauna Environment

Database searches identified 10 Threatened and Near Threatened fauna species (as well as an additional 12 species that are not Threatened or Near Threatened but are listed under the EPBC Act as Marine and / or Migratory fauna species) as potentially occurring within the study area.

No Threatened or Near Threatened fauna species were recorded during the field surveys. However the mine footprint includes potential habitat for six Threatened and Near Threatened fauna species (i.e. Yakka Skink, *Egernia rugosa;* Squatter Pigeon, *Geophaps scripta scripta* Black-chinned Honeyeater, *Melithreptus gularis*; Black-throated Finch, *Poephila cincta cincta*; Australian Painted Snipe, *Rostratula australis;* and Troughton's Sheathtail-bat, *Taphozous troughtoni*).

A total of 133 vertebrate species were recorded during field surveys, including 11 Regionally Significant fauna species and 4 non native species.

Assessment of the fauna habitat values of the overall study area found that biological values were found to be low, due to the highly disturbed and degraded nature of most habitats (i.e. a large proportion of the area consists of rough blade-ploughed Buffel Grass pasture). The exception to this was found to be the Bimble Box Nature Refuge and the adjoining Cavendish area.

Open woodland habitats occupy approximately 30% of the study area where dominant tree species are eucalypts and acacias. Understorey is typically Buffel Grass, however woodland habitats within both the Bimblebox Nature Refuge and the Cavendish area are more complex, consisting primarily of native shrubs and grasses with occasional patches of Buffel Grass. These habitats recorded the greatest number of native fauna species, including many species of woodland birds and mammals such as the Desert Mouse (*Pseudomys desertor*) which appear to be dependant upon habitats with relatively intact, native vegetation.

The riverine habitats in the eastern edge of the study area are heavily grazed and fragmented with an understory dominated by Buffel Grass. Nonetheless, they were considered to have important habitat value for mobile species such as bats and some birds, and also species closely associated with the larger riverine trees, such as Common Brushtail Possums (*Trichosurus vulpecular)* and hollow nesting birds.

The Buffel Grass pasture habitat is of generally poor ecological value, although they were found to provide food resources for some Regionally Siginificant fauna species (e.g. Rufous Bettong, *Aepyprymnus rufescens* and Spectacled Hare-wallaby, *Lagorchestes conspicillatus*).

Potential Impacts and Mitigation Measures

The majority of the mine will be underground and is unlikely to impact on terrestrial flora and fauna. The open cut and clearance footprint of the mine will be approximately 14,600 ha, of which 69% is located within Buffel Grass pasture of low terrestrial ecological value.

No EPBC Act listed Threatened Communities or VM Act Endangered or Of Concern communities will be impacted by the mine.

The footprint requires unavoidable clearing of approximately 4,595 ha of Least Concern remnant vegetation. This clearing will have High impacts upon:

- RE 10.3.27, listed as Of Concern under the DERM Biodiversity Status;
- RE 10.3.12, listed as Least Concern under the VM Act;
- The Bimblebox Nature Refuge;

- Large-podded Tick-trefoil; and
- Desert Mouse (*Pseudomys desertor*).

The clearing will also have a Medium impact upon:

- Riparian / Wetland REs associated with Lagoon Creek and some of its tributaries;
- Two REs listed as Endangered under the DERM Biodiversity Status;
- RE 10.3.4, listed as Of Concern under the DERM Biodiversity Status;
- Black-chinned Honeyeater;
- Squatter Pigeon;
- Black-throated Finch; and
- Regionally Significant and Least Concern fauna in general.

Operation of the mine also has potential to have indirect impacts upon terrestrial flora and fauna including High impacts on the Bimblebox Nature Refuge, Large-podded Tick-trefoil and Desert Mouse, although (assuming there is not significant alteration of hydrological characteristics of areas adjoining and downstream of the mine) these would largely be avoidable with the implementation of appropriate mitigation measures.

Waratah Coal proposes to develop an Environmental Offsets Package for the project in accordance with Commonwealth and Queensland offset policies to compensate for unavoidable ecological impacts. Subject to landholder views, this package could potentially include establishment of an offset rehabilitation linkage from the Bimblebox Nature Refuge to currently isolated remnant vegetation on the range to the northwest of the site.

1.0 Introduction

Unidel Group was commissioned by Waratah Coal Pty Ltd (Waratah Coal) to undertake a terrestrial flora and fauna assessment for the proposed mine site for the China First Project.

Waratah Coal intends to establish a new coal mine, railway and port facilities to export high volatile, low sulphur, steaming coal to international markets. The coal is to be sourced from Waratah Coal's mining tenements near Alpha in the Galilee Basin, Central Queensland.

The mine site is located approximately 35 km north west of Alpha. The exploration tenements cover an area of 4,887 km^2 and are wholly situated in the Desert Uplands bioregion of central western Queensland. The location of the proposed mine is illustrated in **Figure 1**.

2.0 Purpose

This technical report has been developed with the aim of addressing the Terms of Reference (TOR) for the Project and provides specialist information for input into the China First Project Environmental Impact Statement (EIS).

A report which specifically considers only those matters of significance under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is provided in **Appendix 1**.

This study has considered publically available databases, previously published information and studies and detailed field surveys undertaken specifically for the Project.

The report examines the potential and known occurrences of protected plants, animals and vegetation communities as identified under the EPBC Act, the Queensland *Nature Conservation Act 1992* (NC Act) and the Queensland *Vegetation Management Act 1999* (VM Act).

The study also considers regionally significant species and areas of special biodiversity value as identified in the Queensland Government's Department of Environment and Resource Management (DERM, formerly the Environment Protection Agency) Biodiversity Assessment and Mapping Methodology (BAMM) for the Desert Uplands bioregion, and declared weed species under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act). General biodiversity values, evaluated in terms of least concern flora and fauna, are also considered.

Finally, the report discusses the nature conservation values of the areas likely to be affected by the Project and identifies mitigation measures to assist in avoiding or minimising impacts on environmentally sensitive localities and other terrestrial ecology values. Where avoidance is not possible, recommendations are made in relation to appropriate offset activities.

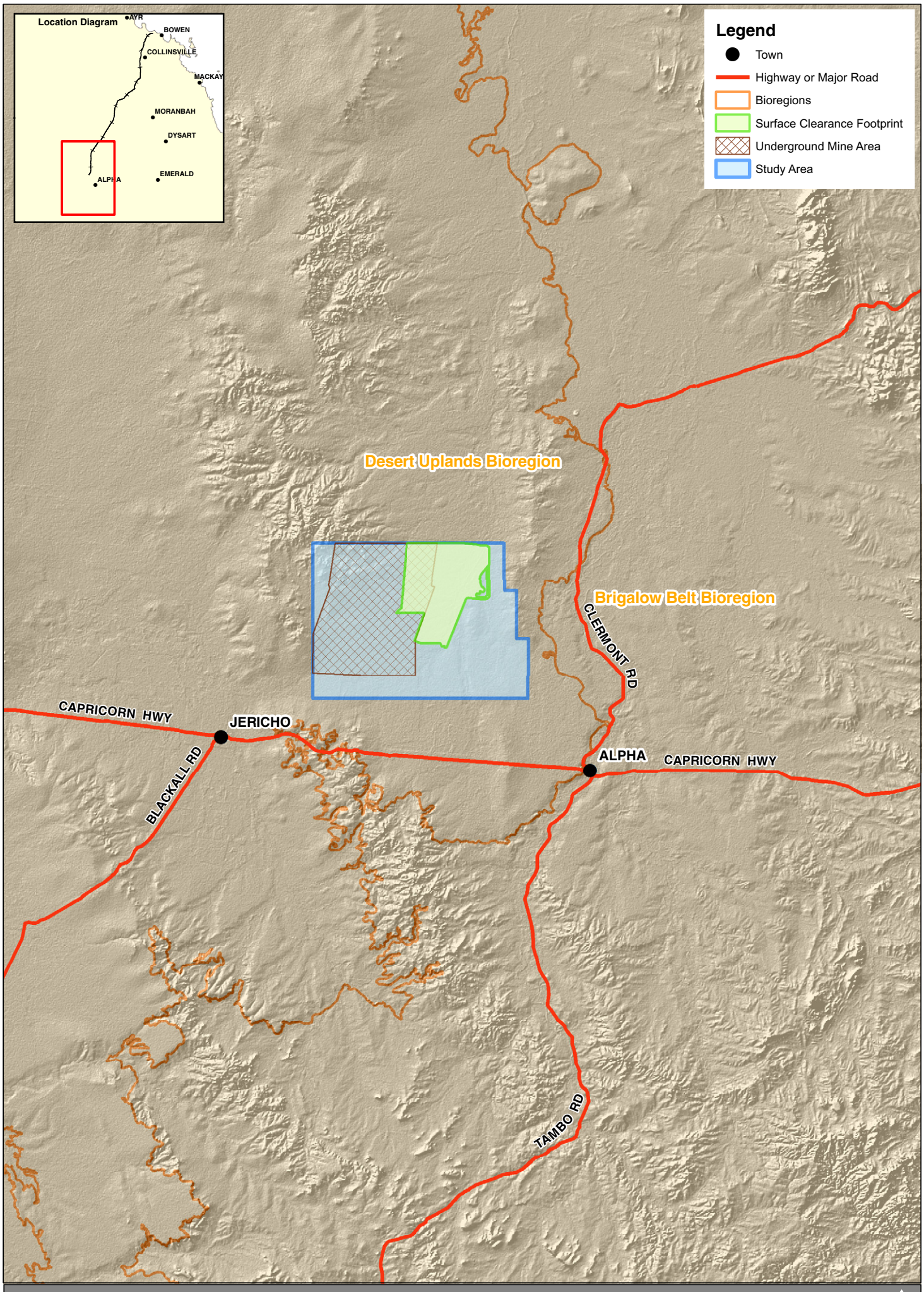

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FIGURE 1: PROPOSED MINE LOCATION

0 5 10 20 km

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3.0 Scope of Work

The scope of this terrestrial flora and fauna assessment is to:

- Assess the existing flora and fauna assemblages through both desktop and field studies, including identification and description of the following key values:
    - Native vegetation communities with reference to the EPBC Act and Queensland Government's Regional Ecosystem (RE) classification;
    - Observed or potentially present taxa listed as threatened under the EPBC Act and / or the NC Act;
    - Observed or potentially present taxa listed as priority taxa under the EPA BAMM for the Desert Upland bioregion;
    - General flora and fauna values;
    - Pest flora and fauna;
    - Wetlands and riparian areas in relation to terrestrial flora and fauna values;
- Identify potential and actual impacts to terrestrial flora and fauna that may occur as a result of project works and evaluate the scope and nature of these impacts;
- Identify potential and actual impacts to Environmentally Sensitive Areas (ESAs), as mapped by DERM; and
- Identify appropriate mitigation measures to help avoid and minimise potential impacts on the ecological features and values.

3.1 Study, Mine and Clearance Footprint Areas

The study area covers approximately 69,777 ha and includes:

- the mine surface clearance footprint (14,615ha), which corresponds to the area to be cleared to enable the mine to be developed, and
- the underground longwall area (29,755 ha) (**Figure 1**).

3.2 Legislative Framework

Environment Protection and Biodiversity Conservation Act 1999

Pursuant to the EPBC Act a person must not take an action that will have or is likely to have an impact on any Matters of National Environmental Significance (MNES).

MNES which, when present, trigger the jurisdiction of the Australian Government's Department of Environment, Water, Heritage and the Arts (DEWHA) include:

- World heritage places;
- National heritage places;
- Wetlands of international significance (Ramsar wetlands);

- Threatened ecological communities and species;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park; and
- Nuclear actions.

Other matters that may trigger DEWHA jurisdiction include actions that are located within or will affect Commonwealth lands and / or actions where Commonwealth agencies are proposing to undertake the action.

State Development and Public Works Act 1971

The *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) enacts a range of powers and functions to facilitate the development of large projects in Queensland. These mechanisms include declarations of projects of State Significance, State development area and the power to compulsorily acquire land for infrastructure.

The China First Coal Project (then named the Galilee Coal Project) has been declared a significant project by the Coordinator-General under the SDPWO Act. Pursuant to s 26 (1) (a) the Project is required undertake a formal EIS process, which is to be coordinated by the Department of Infrastructure and Planning on behalf of the Coordinator-General.

Sustainable Planning Act 2009

The *Sustainable Planning Act 2009* (Qld) (SP Act) is Queensland's principle planning legislation. This legislation seeks to achieve sustainable planning by managing the process by which development takes place, managing the effects of development on the environment and continuing the coordination and integration of local, regional and State planning.

Environmental Protection Act 1994

The *Environmental Protection Act 1994* (Qld) (EP Act) sets out the regulatory framework to protect the environment in the context of Ecological Sustainable Development (ESD). This Act provides for a wide range of tools, including, Environmental Protection Policies, an environmental impact process and the establishment of general environmental duty and the duty to notify of environmental harm.

Vegetation Management Act 1999

The VM Act regulates the clearing of remnant vegetation and high value regrowth.

The VM Act also provides for the preparation of mapping to identify areas of high conservation value, areas vulnerable to land degradation and remnant vegetation and sets out policies against which applications for clearing vegetation are assessed.

Nature Conservation Act 1992

The NC Act sets out the regulatory framework for the identification, gazettal and management of protected areas and the protection of native flora and fauna.

Land Protection (Pest and Stock Route Management) Act 2002

The LP Act provides for the management of pests on land and the management of the stock route network. This Act identifies State declared plants (weeds) and animal pests and the management requirements of landholders to control these species.

4.0 Methodology

4.1 Nomenclature

Scientific and common names for terrestrial flora and fauna are consistent with those used in the following sources:

- Bostock and Holland (2007) and botanical binomials presently accepted by the Queensland Herbarium (DERM) for flora;
- Cogger (2000) for amphibians and reptiles;
- Marcombe (2000) for birds; and
- Van Dyck and Strahan (2008) for mammals.

4.2 Flora Assessment

4.2.1 Determination of Flora Species and Ecological / Vegetation Communities Significance Level

Significant Ecological Communities / REs are listed by the EPBC Act as Critically Endangered, Endangered or Vulnerable, by the VM Act as Endangered, Of Concern and Least Concern and by DERM as Endangered, Of Concern and No Concern at Present under DERM's Biodiversity Status classifications.

Listed Threatened and Near Threatened flora species are defined as those taxa listed in the EPBC Act as Critically Endangered, Endangered or Vulnerable; and in the NC Act as Endangered, Vulnerable or Near Threatened.

Regionally Significant flora are defined as those taxa not listed as Threatened or Near Threatened species, but have been identified as being of conservation significance within the Desert Uplands Flora, Fauna and Landscape Expert Panel Report (EPA 2005), Conservation of Biodiversity in the Desert Uplands Report (Morgan *et al.* 2002) and the CSIRO Rare or Threatened Plants (ROTAP) (Briggs and Leigh 1995).

Environmentally Sensitive Areas (ESAs) are identified by DERM ESA online mapping.

All other native flora species have been designated as Least Concern.

4.2.2 Determination of Weed Species Significance Level

The *Australian Weeds Strategy* identifies priorities for weed management across the nation with the aim of minimising the impact of weeds on Australia's environmental, economic and social assets. As part of this, a list of nationally agreed priority plant species (Weeds of National Significance [WONS]) has been established for control and management based on species rankings of invasiveness, potential to spread, and impact on socio-economic and environmental assets.

The LP Act, also identifies target weed species that have, or may potentially have, a serious economic, environmental or social impact. Declared plants are classified into three management priorities, based on their current extent and potential to spread, including:

- **Class 1 plants**. Weed species that are not commonly present in Queensland and, if introduced, would cause an adverse economic, environmental or social impact. Current

infestations in Queensland are subject to eradication from the state and landowners must take reasonable steps to keep their land free of these species;

- **Class 2 plants**. Weed species that are established in Queensland and have, or could have an adverse economic, environmental or social impact. Landowners must take reasonable steps to keep their land free of Class 2 plants; and

- **Class 3 plants**. Class 3 plants are also considered established in Queensland and have, or could potentially have, an economic, environmental or social impact. The primary objective of this listing is to prevent the sale, and therefore spread of these pests into new areas, and landholders are not required to control these species unless their land is adjacent to an environmentally significant area, such as:

    - A protected area;
    - Land dedicated as a reserve for environmental purposes under the Queensland *Land Act 1994*;
    - A World Heritage area listed under the World Heritage Convention;
    - An area supporting a critically endangered ecological community in the list established under the EPBC Act;
    - A declared Ramsar wetland under the EPBC Act;
    - An area of high nature conservation value under the VM Act; or
    - An area, other than State-controlled land, identified in a local government's pest management plan as an area that has special environmental significance for native wildlife.

WONS and declared plants of Queensland are considered significant weed species. Other invasive non native species are considered environmental weed species.

4.2.3 Flora Desktop Assessment

A desktop review was undertaken to indentify the key flora and vegetation community values that are known or likely to occur within the broader study area. The data search was undertaken in August 2009 and covered an area including a 20 km buffer around the study area, equating to the following coordinates: Lat. -23° 9' 21.027" to -23° 49' 6.6252" and Long. 146° 8' 46.071" to 146° 45' 21.06".

The flora desktop assessment included a review of:

- Queensland Herbarium RE mapping (Version 6.0, 2009) to identify significant vegetation communities mapped;

- Queensland Herbarium HERBRECS data and DERM Wildlife Online databases to identify all flora species of conservation significance known to occur within the wider study area;

- DEWHA Protected Matters Search Tool to identify all MNES known or potentially occurring within, or close to, the study area including Ramsar-listed wetlands, critical habitat areas, threatened ecological communities and flora species and other matters including conservation areas (including National Parks, Conservation Parks and State Forests);

- Queensland Herbarium Regrowth Moratorium mapping to identify areas of high-value regrowth vegetation as listed under the Queensland *Vegetation Management (Regrowth Clearing Moratorium) Act 2009* (RM Act);

- DERM Queensland Essential Habitat Area (EHA) mapping to identify essential habitat areas for Threatened listed flora species;

- DERM Desert Uplands Biodiversity Planning Assessment (BPA) to identify areas of ecological significance at the state, regional and local level;

- DERM ESA online mapping to identify key ecologically sensitive areas including, wetlands, Endangered REs (Biodiversity Status) and nature refuges;

- Directory of Important Wetlands (Blackman *et al.* 1999) database;

- DERM Queensland Wetlands mapping (WetlandInfo);

- Satellite imagery to gain an appreciation of the project's proximity to sensitive areas, assess vegetation patterns and identify target areas for field investigations;

- Review of the Desert Uplands Flora, Fauna and Landscape Expert Panel Report (EPA, 2005), Conservation of Biodiversity in the Desert Uplands Report (Morgan *et al.* 2002) and the CSIRO Rare or Threatened Plants (ROTAP) (Briggs and Leigh 1995) to identify regionally significant flora species;

- A recently completed flora assessment of the Bimblebox Nature Refuge undertaken by WorleyParsons (2009); and

- Discussion with relevant research authorities including Dr Rod Fensham from the Queensland Herbarium and Eric Vanderduys from CSIRO Sustainable Ecosystems.

It is recognised that the information gained from these databases has caveats attached regarding the robustness or completeness of the information. For example HERBRECS data is based almost exclusively on plant specimens actually recorded as present in the given locations. The absence of any specimen records for a particular species from an area does not imply that that species does not occur in that area. Data from the DEWHA website is based on a combination of actual records, primarily from State Government databases, combined with modelled distributions of species according to their ecological characteristics.

Vegetation clearance calculations were based on the existing Queensland Herbarium RE mapping (which was found to be broadly accurate for the study area).

4.2.4 Terrestrial Flora Field Assessment

Field surveys of the project were conducted over a total of 11 days in October 2009 and April 2010 by Senior Botanist, Wayne Harris, with assistance from Ecologist, James Gubby and Environmental Scientists Ruth Smith and Renee Coleman (CVs provided in **Appendix 2**).

The field survey included:

- Ground truthing of a total of 31 sites; mostly within REs mapped within the Study area (**Appendix 3** provides vegetation assessment proformas). All of these sites were assessed to the 'Tertiary' level in accordance with the methodology outlined by the

Queensland Herbarium (Nelder *et al.* 2005) and data collected is compatible with the Queensland Herbarium's CORVEG database;

- Investigation of the presence / absence or likely presence / absence of the Threatened and Near Threatened flora species and Significant Ecological Communities including vehicle and foot based random meander surveys focused within and adjoining the mine surface clearance footprint and in the vicinity of all tertiary survey sites as well as vehicle based surveys along all access tracks to and between the tertiary sites (tertiary flora sites are shown in **Figure 2**);

- Observations on the wider environment surrounding the study area so that potential impacts could be considered in the local, regional and State contexts; and

- Observations of the general distributions of declared pest plants.

Data collected at the Tertiary flora survey sites included:

- Confirmation of mapped REs;

- Description of vegetation present at each survey site;

- Identified presence of significant flora species;

- Identified presence of significant weeds; and

- General condition of the vegetation communities present.

GPS coordinates were taken using hand held GPS (accuracy + / - 10-20 m) to identify survey site locations and to assist in validating the existing Queensland Herbarium RE mapping. A complete list of flora species is given in **Appendix 4**.

4.3 Terrestrial Fauna Assessment

4.3.1 Determination of Fauna Significance Level

Listed Threatened and Near Threatened fauna are defined as those taxa listed in the EPBC Act as Critically Endangered, Endangered or Vulnerable; and in the NC Act as Endangered, Vulnerable or Near Threatened.

'Regionally Significant fauna species' are defined as those taxa not listed as Threatened or Near Threatened species under the EPBC Act and / or NC Act, but have been listed as non-threatened priority taxa for the Desert Uplands bioregion (Morgan *et al.* 2002; EPA 2005).

All other native fauna have been designated as Least Concern. This includes those species that have been given extra protection as Migratory and / or Marine Protected Species under the EPBC Act, but which are not Threatened / Near Threatened or Regionally Significant fauna.

4.3.2 Fauna Desktop Assessment

The fauna desktop assessment was undertaken in August 2009 and covered an area including a 20 km buffer around the study area, equating to the following coordinates: Lat. -23°9' 21.027" to -23°49' 6.6252" and Long. 146°8' 46.071" to 146°4 5' 21.06".

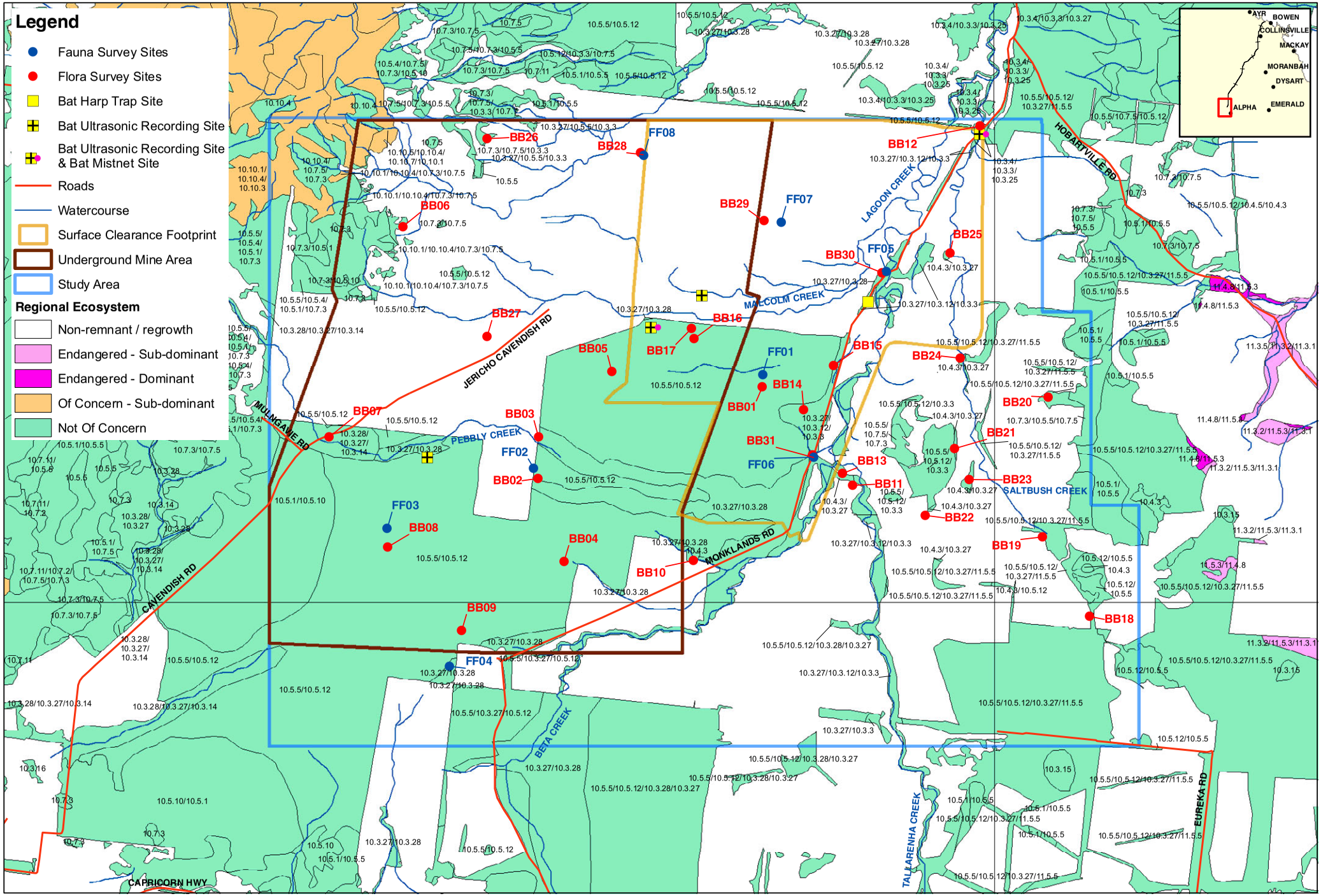

FIGURE 2: REGIONAL ECOSYSTEM MAPPING AND LOCATION OF FLORA AND FAUNA SURVEY SITES

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The fauna desktop assessment included review of:

- DERM Wildlife Online databases;
- Queensland Museum data;
- Queensland EHA mapping;
- Bird Data Online;
- DERM ESA online mapping;
- DEWHA Protected Matters Search Tool;
- Priority Taxa under the BAMM Criteria H;
- Review of the Desert Uplands Flora, Fauna and Landscape Expert Panel Report (EPA, 2005), Conservation of Biodiversity in the Desert Uplands Report (Morgan *et al.* 2002) and the CSIRO Rare or Threatened Plants (ROTAP) (Briggs and Leigh 1995) to identify regionally significant flora species; and
- A recently completed flora assessment of the Bimblebox Nature Refuge undertaken by WorleyParsons (2009).

4.3.3 Fauna Field Assessment

General Habitat Assessment

The habitat assessment included undertaking general observations across the study area, with a focus on the mine footprint and adjoining areas as well as recording the following fauna habitat values at each of the eight fauna trapping sites shown in **Figure 2**:

- Landform;
- Structural vegetation characteristics;
- Presence / abundance of hollow-bearing trees;
- Level of disturbance (including vehicular, grazing or agricultural activities);
- Degree of environmental weed infestation;
- Evidence of, and estimated time since last bushfire;
- Density and nature groundcover (e.g. rocks, logs, vegetation and leaf litter); and
- Presence / absence of permanent or ephemeral freshwater resources and distance to riparian areas and free standing water.

Fauna Trapping Methodology

Fauna surveys were conducted over a total of 20 days in October 2009 and April 2010 by Principal Ecologist, Bruce Thomson with assistance from Environmental Scientists, Sandrine

Martinez and Ruth Smith (CVs provided in **Appendix 2**). The dry season survey (October 2009) included trapping at Sites BB01 and BB02 over eight days and the wet season survey (April 2010) included trapping at all eight sites over twelve days.

Four habitat areas representing the three different habitat types (i.e. open woodland, riverine and Buffel Grass pasture) which occur within the study area were surveyed. In each of these four habitat areas, two sites were surveyed, equating to a total of eight sites for the study area (**Figure 2**). Each site was surveyed for a total of four days.

Fauna surveys were conducted using pitfall traps, Elliott traps, funnel traps, bat traps, ultrasonic bat recording, observational bird transects and night spotlighting. Details of this trapping / observation effort are summarized in **Table 1**. Illustrations of traps used are shown in **Plate 1 and 2**.

Table 1. Trapping Effort

Trapping / Observational Technique	# of Traps per Site per Day	# of Trap Days	Total Trapping / Observational Effort
Pitfall traps	5	44	220 trap nights
Elliott traps	20	44	880 trap nights
Funnel traps	8	44	352 trap nights
Bat traps	2	5	10 trap nights
Bat Ultrasonic recording	8 hrs	4	32 hrs recordings
Spotlighting	4 hrs	8	32 hrs
Bird survey	4 hrs	8	32 hrs

Pitfall traps consisted of pvc tubes of approximately 25 cm in diameter and 45 cm deep. Five pitfall traps, located at approximately 5 m spacings, were placed in each sampling site along a plastic fence line.

One set of 20 Type A Elliott traps were deployed at each site for a period of four nights. Traps were positioned in a line and spaced out at 10 m intervals. They were baited using a mixture of peanut butter and rolled oats.

Four funnel traps were used at each site in conjunction with pitfall traps and were positioned along the plastic fence line.

Ultrasonic bat recording was undertaken at / in the vicinity of each site using a time expanded recording system from Binary Acoustic Technology (http://binaryacoustictech.com/) and was used as an adjunct to bat trapping with three bank harp traps and mist netting.

Birds were identified from either direct observation or their distinctive calls at dusk and dawn for an hour over two consecutive days in the vicinity of each site.

Spotlighting was undertaken at night for two consecutive nights at / or in the vicinity of each site using 50 watt hand held spotlights and head torches.

The fauna field assessment was conducted in accordance with the DERM's Queensland Parks and Wildlife Service's Scientific Purposes Permit No. WISP05501608 and Queensland Department of Primary Industries and Fisheries (DPI&F) Animal Ethics Committee Certification No. CA 2008 / 08 / 294.

a

b

Plate 1. Types of traps used in this study. a, pitfall trap; b, Elliott trap.

a

b

Plate 2. Types of traps used in this study. a, funnel trap; b, harp trap.

4.4 Assessment of Significance of Impacts

The significance of the potential impacts associated with the construction and operation of the mine have been assessed using the following matrix. This considers both the likelihood of a consequence (L) occurring and the consequence if the impact if the impact occurs (C). Through reference to the Potential Impact Assessment Matrix below the impact is classified as either Positive Effect, Low, Medium, High or Extreme.

An analysis of each risk is undertaken to determine an environmental event's likelihood of occurrence and its consequences. Each class of consequence is rated a score of 1 – 5, where "1" is minor consequence to "5" is severe.

A five-level qualitative description of the likelihood and consequences for each risk enables a semi-quantitative method to be used to calculate a 'score' for each risk.

Likelihood of the Consequence Occurring

Score	Descriptor	Description
5	Almost Certain	Is expected to occur
4	Likely	Will probably occur
3	Possible	Might occur
2	Unlikely	Unlikely to occur
1	Rare	May occur in exceptional circumstances

Consequence if the Impact Occurs (adapted from GHD 2010)

Score	Descriptor	Description
5	Severe	Massive temporal and spatial effect. Extensive long term environmental harm and / or harm that is extremely widespread. Impacts unlikely to be reversible within 10 years. Significant non-compliance with Environmental Auth7ority and / or other approval conditions and regulatory requirements, highly likely to result in formal enforcement action. Serious injury or fatality to members of the public. Permanent loss of protected social or cultural values (i.e. not in accordance with agreements in place).
4	Major	Major temporal and spatial effect. Major or widespread, unplanned environmental impact on or off the site. Significant resources required to respond and rehabilitate. Any unplanned impacts are reversible within 2-10 years. Non-compliance with Environmental Authority and / or other approval conditions and regulatory requirements, with potential to result in formal enforcement action. Degradation of overall conservation status of species or ecosystems. Serious disruption to residential amenity and day to day activities. Likely to give rise to significant complaints. Minor injury to members of the public requiring first aid or minor medical treatment. Loss of protected social or cultural values that may take several years or more to restore.

3	Moderate	Moderate temporal and spatial effect. Moderate, unplanned environmental impact contained within the site or minor impact that is more widespread on and off the site. Any unplanned impacts are typically reversible within 2 years. Minor non-compliance with Environmental Authority and / or other approval conditions and regulatory requirements, unlikely to result in formal enforcement action. Planned or unplanned impacts do not result in degradation of overall conservation status of species or ecosystems. Moderate disturbance to local residents or community, short to medium duration, moderate disruption to day to day activities. Some complaints may arise.
2	Minor	Minor temporal and spatial effect. Minor, unplanned localised environmental impact, contained on-site or with negligible off site effects. Any unplanned impacts are reversible within 6 months. No non-compliance with environmental Authority and / or other approval conditions and regulatory requirements. Planned or unplanned impacts do not result in degradation of overall conservation status of species or ecosystems. Some nuisance or disturbance to local residents or the community, of short duration. Normal activities are not disrupted or are not briefly disrupted.
1	Negligible	Slight temporal and spatial effect. Negligible environmental effect. Any impacts are contained on site and short term in nature. Minimal if any resources required to respond to incident. No non-compliance. Negligible impact on local residents and community.
	Positive effect	A positive outcome is expected.

Potential Impact Assessment Matrix

Likelihood	Consequence					
	Severe (5)	Major (4)	Moderate (3)	Minor (2)	Negligible (1)	Positive
Almost Certain (5)*	Extreme (10)	High (9)	High (8)	Medium (6)	Medium (6)	Positive effect
Likely (4)	High (9)	High (8)	Medium (7)	Medium (6)	Medium (5)	Positive effect
Possible (3)	High (8)	Medium (7)	Medium (6)	Medium (5)	Low (4)	Positive effect
Unlikely (2)	Medium (7)	Medium (6)	Medium (5)	Low (4)	Low (3)	Positive effect
Rare (1)	Medium (7)	Medium (5)	Low (4)	Low (3)	Low (2)	Positive effect

* Includes “unavoidable” impacts.

4.5 Assumptions and Limitations

In undertaking this terrestrial flora and fauna assessment the following assumptions have been applied:

- The existing DERM RE mapping of the study area was found through the field survey work to be generally accurate and has been used as the basis for estimating areas of each REs present and proposed to be cleared as well as for estimating the extent of these REs within the 10 km buffer area and the bioregion;
- Threatened and Near Threatened fauna species which are known or predicted to occur in the wider area, and for which suitable habitat is present within the study area, are considered to be present (i.e. the precautionary approach has been applied);
- The flora surveys were undertaken in October 2009 and April 2010 when conditions for detection of the Near Threatened Large-podded Tick-trefoil (*Desmodium macrocarpum*) (a herbaceous perennial with stems reaching 0.5 m) individuals and groups were problematic. It was very dry in October 2009 and many specimens where in desiccated condition, and in April 2010 the groundlayer had become dominated by tall dense grasses (particularly Buffel Grass, *Pennisetum ciliare*). As such, these surveys were unable to confirm the potential extent of Large-podded Tick-trefoil beyond the distribution previously mapped by WorleyParsons (2009) including the Queensland Herbarium site. Due to the challenges of surveying for this species it is considered possible that additional individuals and groups occur within the study area;
- The mine surface clearance footprint will be limited to the area shown in **Figure 1**;
- Diversion of Lagoon Creek and its tributaries will be undertaken in a manner which does not significantly alter the hydrological, water quality or sedimentation characteristics of down or upstream sections of these watercourses;
- There is not significant alteration of hydrological characteristics of areas adjoining and downstream of the mine;
- Baseflow characteristics of watercourses will not be significantly altered; and
- No significant subsidence will be caused by the mine and that the hydrological characteristics of the land surface above underground mine areas will not be significantly altered.

5.0 Existing Environment

5.1 State, Bioregional and Local Context

The project is located within the Desert Uplands bioregion. This bioregion encompasses an area of about 70,300 sq. kms and straddles the Great Dividing Range between Blackall and Pentland in central northern Queensland. The bioregion partly lies within the Galilee and Eromanga Basins. These basins consist of Mesozoic to Tertiary (less than 251 million years ago) sediments including major coal and gas deposits (ANRA 2009).

The vegetation of the bioregion consists predominantly of eucalypt and acacia woodlands (often with an open spinifex understorey) and acacia woodlands.

Most of the bioregion is under leasehold tenure and is used for cattle grazing and some sheep grazing in the west (DNRW 2006). Recent work by McCosker *et al*. (2009) suggests that there is some degree of compatibility between grazing management and biodiversity within this bioregion.

The dominant land use across the study area is cattle grazing. A significant portion of the site is cleared of standing timber for cattle pastures. These areas are dominated by Buffel Grass (*Pennisetum ciliare*), an introduced invasive pasture species which is well established on rough, blade ploughed terrain on low, undulating hills (e.g. Sites BB28 and BB29; **Appendix 3**, **Plate 3**).

Plate 3. Buffel Grass pasture.

Part of the mine surface clearance footprint occurs in the north and eastern parts of the Bimblebox Nature Refuge, an area gazetted under the *Nature Conservation (Protected Areas)*

Regulation 1994 (**Figure 3**, **Plate 4**). The vegetation within this area consists predominantly of Poplar Box (*Eucalyptus populnea*) and Silver-leaved Ironbark (*Eucalyptus melanophloia*) open woodland (REs 10.5.12, 10.5.5) (see **Section 5.2.1** for more details). The Bimblebox Nature Refuge is identified as containing 'Special biodiversity values' and is of value as a 'Wildlife refugia'. It is mapped as being of Local Significance within the Desert Uplands Biodiversity Planning Assessment (EPA 2005).

Plate 4. Bimblebox (*Eucalyptus populnea*) open woodland with native understorey.

The areas of RE 10.3.27 / 10.3.28 within the Bimblebox Nature Refuge are identified as containing Of Concern RE (Biodiversity status), ''Wildlife refugia', 'Disjunct populations', 'Taxa at limit of geographic range', 'Areas of high species richness' and 'Hollow-bearing trees' and is mapped as being of State Significance (EPA 2005).

Immediately to the south-west of the Bimblebox Nature Refuge the study area encompasses a woodland area with similar vegetation to that of the Bimblebox Nature Refuge. Dominant tree species include Silver-leaved Ironbark, Poplar Box and Lancewood (*Acacia shirleyi*). This area is identified as containing Of Concern RE (Biodiversity status), ''Wildlife refugia', 'Disjunct populations', 'Taxa at limit of geographic range', 'Areas of high species richness' and 'Hollow-bearing trees' and is mapped as being of State Significance (EPA 2005).

Partially cleared sandstone escarpments with some areas supporting Lancewood dominated woodlands are present to the north-west within the study area (**Plate 5**).

Plate 5. Lancewood (*Acacia shirleyi*) open woodland.

To the east the mine surface clearance footprint transects a riverine habitat comprising several ephemeral watercourses including Lagoon Creek. The vegetation within this area is dominated by Poplar Box open woodland and also contains patches of River Red Gum (*Eucalyptus camaldulensis*) (e.g. Site BB24; **Appendix 3**, **Plate 6**) and Brigalow (*Acacia harpophylla*) (e.g. Site BB25, **Appendix 3**). This area is mapped as being of Regional Significance (EPA 2005).

Plate 6. Poplar Box (*Eucalyptus populnea*) and River Red Gum (*Eucalyptus camaldulensis*) open woodland.

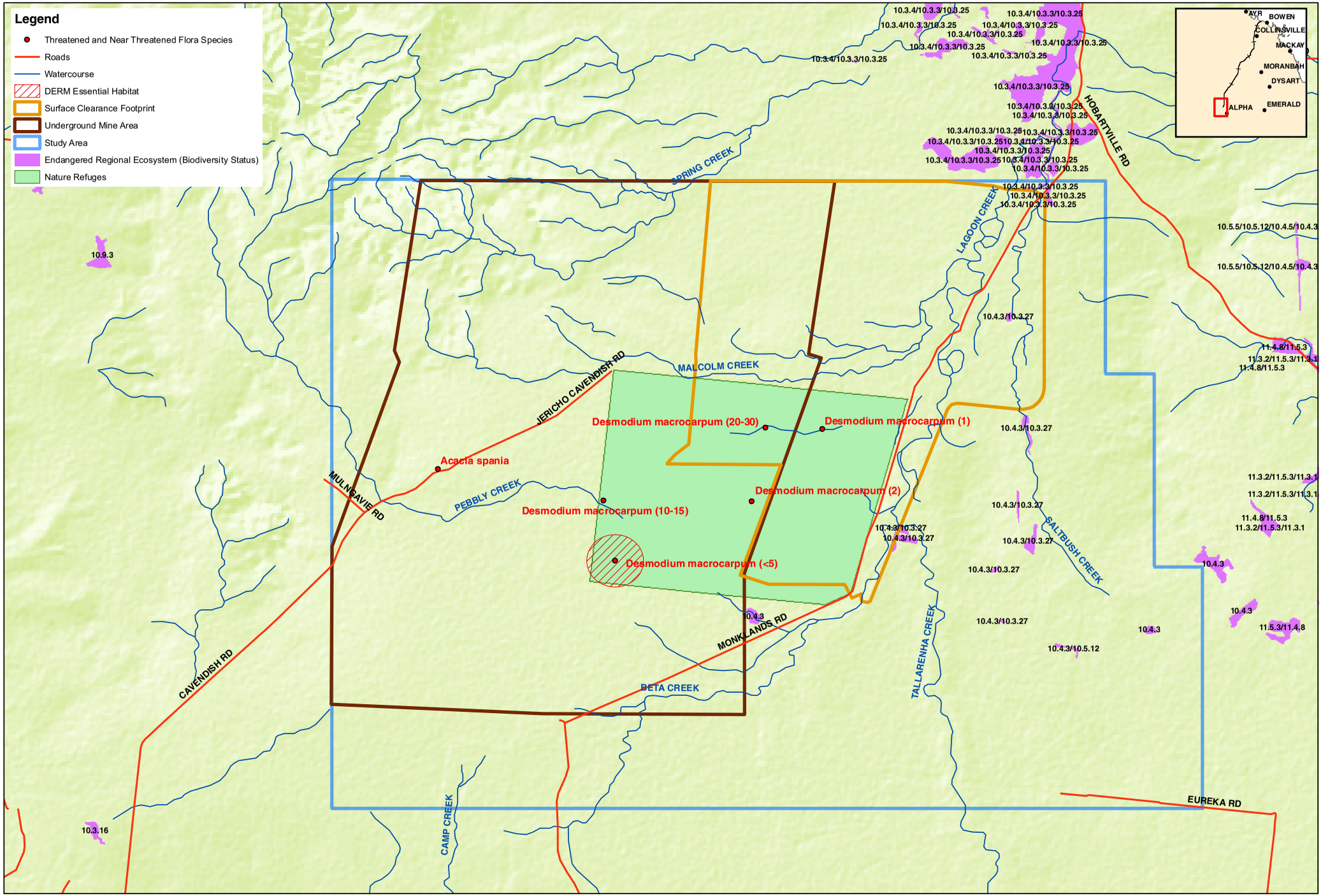

FIGURE 3: DERM ENVIRONMENTALLY SENSITIVE AREAS AND THREATENED AND NEAR THREATENED FLORA SPECIES

0 1.25 2.5 5 km

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5.2 Floral Environment

5.2.1 Environmentally Sensitive Area

There are no Category A ESAs occurring within or adjacent to the study area.

The DERM ESA mapping shows Endangered REs as Category B areas. Category B areas include REs listed as Endangered under the DERM Biodiversity Status classifications (**Table 2; Figure 3**). Two such REs (RE 10.3.25 and RE 10.4.3) occur as small patches in close proximity to the margins of the mine surface clearance footprint.

Bimblebox Nature Refuge is recognised by the DERM ESA mapping as a Category C ESA. It comprises 8,000 ha of remnant semi-arid woodlands dominated by Poplar Box and Silver-leaved Ironbark. The canopy layer is generally open to sparse. The understorey is largely made up of native shrubs, forbs and grasses and the weed cover is less than 5%. A description of the composition of the vegetation within the Bimblebox Nature Refuge is provided in **Appendix 3** (Sites BB01, BB02, BB03, BB04, BB05).

EPA (2004) described the site as having high biodiversity values supporting a wide variety of native grass and fauna species. The vegetation in this area was found to range from average to very good condition with evidence of grazing, clearing for tracks, Buffel Grass invasion and patches of dieback present to varying degrees.

The Bimblebox Nature Refuge is known to contain the Near Threatened flora species, Large-podded Tick-trefoil. Details about this species are provided in **Section 6.2.3** below.

The property managers are collaborating with researchers from the Queensland Herbarium (DERM), Department of Employment, Economic Development and Innovation, CSIRO (Townsville, Davies Laboratory) and the University of Queensland (Fensham, pers. comm.; Vanderduys, pers. comm.). Since 2003 these parties have established a number of experimental trials that aim to determine optimum fire and grazing management for maintaining biological values in the Refuge.

There are no National Parks, State Forests or other ESA's mapped by DERM as occurring within the study area.

5.2.2 Ecological Communities / Regional Ecosystems

The review of the DERM RE mapping identified 21 REs as occurring within the study area (**Figure 2**, **Table 2**), two of which are Of Concern under the VM Act (RE 10.3.4 and RE 10.10.7). Two others listed as Least Concern under the VM Act are classified as Endangered under the DERM biodiversity status (RE 10.3.25 and RE 10.4.3).

Table 2. Mapped REs Located Within the Study Area

Ecological Communities		Status			Present Within Mine Surface Clearance Footprint
RE Number	Description	EPBC Act	VM Act	Bio-diversity	
10.3.3	*Acacia harpophylla* and / or *Eucalyptus cambageana* low open woodland to open woodland on alluvial plains	-	LC	NOC	Yes
10.3.4	*Acacia cambagei* low open woodland to low woodland on alluvial plains	-	LC	OC	Yes

Ecological Communities		Status			Present Within Mine Surface Clearance Footprint
RE Number	Description	EPBC Act	VM Act	Bio-diversity	
10.3.12	*Corymbia dallachiana* and *C. plena* or *C. terminalis* open woodland on sandy alluvial terraces (eastern)	-	LC	NOC	Yes
10.3.14	*Eucalyptus camaldulensis* and / or *E. coolabah* open woodland along channels and on floodplains	-	LC	OC	No
10.3.25	*Eremophila mitchellii* low open woodland on alluvial plains	-	LC	E	Yes
10.3.27	*Eucalyptus populnea* open woodland on alluvial plains	-	LC	OC	Yes
10.3.28	*Eucalyptus melanophloia* or *E. crebra* open woodland on sandy alluvial fans	-	LC	NOC	Yes
10.4.3	*Acacia harpophylla* and / or *Eucalyptus cambageana* open woodland on Cainozoic lake beds	-	LC	E	Yes
10.5.1	*Eucalyptus similis* and / or *Corymbia brachycarpa* and / or *Corymbia setosa* low open woodland to open woodland on sand plains	-	LC	NOC	No
10.5.5	*Eucalyptus melanophloia* open woodland on sand plains	-	LC	NOC	Yes
10.5.10	*Corymbia leichhardtii* open woodland on sand plains	-	LC	NOC	No
10.5.12	*Eucalyptus populnea* open woodland on sand plains	-	LC	NOC	Yes
10.7.3	*Acacia shirleyi* woodland or *A. catenulata* low woodland at margins of plateaus	-	LC	NOC	No
10.7.5	*Eucalyptus thozetiana* open woodland on scarps and on pediments below scarps	-	LC	OC	No
10.7.7	*Melaleuca* spp. and / or *Acacia leptostachya* shrubland on ferricrete (eastern)	-	LC	NOC	No
10.10.1	*Acacia shirleyi* woodland or *A. catenulata* low open woodland on sandstone ranges	-	LC	NOC	No
10.10.3	*Eucalyptus* sp. (Caldervale D. Jermyn AQ 582304) open woodland on sandstone ranges	-	OC	OC	No
10.10.4	*Eucalyptus exilipes* and / or *Corymbia leichhardtii* open woodland on sandstone ranges	-	LC	NOC	No

Ecological Communities		Status			Present Within Mine Surface Clearance Footprint
RE Number	Description	EPBC Act	VM Act	Bio-diversity	
10.10.5	*Corymbia trachyphloia* and / or *C. lamprophylla* or *Eucalyptus mediocris* open woodland on sandstone ranges	-	LC	NOC	No
10.10.7	*Eucalyptus cloeziana* open woodland on sandstone ranges	-	OC	OC	No
11.5.5	*Eucalyptus melanophloia, Callitris glaucophylla* woodland on Cainozoic sand plains / remnant surfaces. Deep red sands	-	LC	NOC	Yes

E = Endangered; OC = Of Concern; LC = Least Concern under the VM Act; NOC = No Concern at Present under Biodiversity status classification.

The field survey found the DERM RE mapping to be generally accurate. Exceptions detailed in **Appendix 3** include an area of recently cleared vegetation (Site BB19) and severly burnt vegetation (Site BB21) which are both outside the mine surface clearance footprint).

Nine REs occur within the mine surface clearance footprint. These are all Least Concern under the VM Act (although two are classified as Endangered and three as Of Concern under the DERM biodiversity status). These Least Concern REs are not well represented in Queensland's conservation estate and are at risk from clearing, and grazing impacts including Buffel Grass invasion which in turn contributes to frequent and hot fires.

While no REs mapped by DERM were listed under the EPBC Act, the EPBC Act Protected Matters Search Tool identified three Threatened Ecological Communities potentially occurring within the broader study area. These are:

- Brigalow (*Acacia harpophylla* dominant and co-dominant);
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin; and
- Weeping Myall Woodlands.

The field survey confirmed that no EPBC Act listed Threatened Ecological Communities occur within the study area. Minor occurrences of Brigalow dominant and co-dominant REs were found to be present (i.e. RE 10.3.3 and RE 10.4.3) but these REs are not included within the EPBC Act definition of the Threatened Ecological Community "Brigalow (*Acacia harpophylla* dominant and co-dominant)".

The majority of the watercourses within the study area and mine surface clearance footprint are designated under the RM Act. However, the mine surface clearance footprint does not contain any areas mapped as high-value regrowth under the RM Act.

5.2.3 Threatened and Near Threatened Flora Species

Database searches identified three flora species listed as Threatened or Near Threatened under the NC Act that are known to have ranges that overlap the study area. These species and their habitat preference are outlined in **Table 3**.

Table 3. Threatened and Near Threatened Flora Species Recorded as Occurring Within or Having Ranges That Overlap the Study Area.

Common Name	Scientific Name	Status		Preferred Habitat	Source
		NC Act†	EPBC Act		
Western Rosewood	*Acacia spania*	NT	-	Shallow sandstone-derived soils in open eucalypt woodlands or *Acacia* shrub-lands. Known within study area but no preferred habitat within mine surface clearance footprint.	1,2
Large-podded Tick-trefoil	*Desmodium macrocarpum*	NT	-	Open forests and woodlands and semi-evergreen vine thickets in red earths, rarely sandy clay soils throughout the coastal ranges of eastern QLD as far west as Longreach and at altitudes to 884 m (DNR 1999). Known within study area and mine surface clearance footprint.	1,2,3
Round-leaved Myrtle	*Micromyrtus rotundifolia*	V	-	Acacia shrublands and in eucalypt-acacia woodlands on breakaways associated with the Great Dividing Range in shallow and sandy red soils in Central West QLD. Known north east of the study area but no preferred habitat within mine surface clearance footprint.	1,2

Status: [1]: Commonwealth (EPBC) listed: **E** = Endangered; **V** = Vulnerable

[2]: State (NC Act) listed: **E** = Endangered; **V** = Vulnerable; **NT** = Near Threatened

Source: 1 = QEPA WildNet record; **2** = Herbrecs; **3** = Bimblebox Rapid Assessment WorleyParsons Field Survey May 2009

The Queensland EHA mapping also identified one essential habitat area for Large-podded Tick-trefoil occurring within the study area (**Figure 3**).

Western Rosewood (*Acacia spania*) is a Near Threatened species which HERBRECS indicates is growing at the Cavendish Homestead "on a small lense of red sand amoungst cleared Silver-leaf Ironbark" (-23.4313, 146.2877 GDA decimal degrees). The location of this record is approximately 7 km west of the mine surface clearance footprint (**Figure 3**). The Queensland Herbarium also has a record of the species 21.5 km southeast of Jericho.

The WorleyParsons (2009) survey of the Bimblebox Nature Refuge recorded Large-podded Tick-trefoil plants at five locations (**Figure 3**), one of which had been previously recorded by the Queensland Herbarium (in 2003). The October 2009 and April 2010 surveys were unable to confirm the potential extent of Large-podded Tick-trefoil beyond these five locations. Conditions for detection of Large-podded Tick-trefoil individuals and groups were problematic during both

† Note that Western Rosewood and Large-podded Tick-trefoil were listed as Rare under the NC Act until early 2010. However, the Rare category has been phased out and replaced by the category Near Threatened (DERM 2010). All previously listed Rare species are being progressively reviewed by DERM. In the mean time the transfer of Rare species to the Near Threatened category does not change the management requirements for these species (DERM 2010).

these periods. Indeed, in October 2009 weather conditions were very dry (specimens were dessicated, **Plate 7**) and in April 2010 the groundlayer had become dominated by tall dense grasses (particularly Buffel Grass). Due to the challenges of surveying for this species it is considered likely that additional indivuals and groups occur within the study area.

The WarleyParsons (2009) survey identified 50-60 individual Large-podded Tick-trefoil plants. The majority of these occur at two sites while the other three sites recorded less than five individuals at each site. The numbers of individuals recorded at each site are represented in the following table and illustrated in **Figure 3**.

Table 4. Numbers of Large-podded Tick-trefoil Individuals Previously Recorded

Site	Coordinates (GDA decimal degrees)	Numbers of individuals
1	- 23.46154962540 - 146.34912210200	< 5
2	-23.41767020590 - 146.42038691800	1
3	-23.41713550330 - 146.40076463900	20-30
4	-23.44261624300 - 146.39600947200	2
5	-23.44231098760 - 146.34495789600	10-15

(Source: WorleyParsons 2009)

Based on the WorleyParsons (2009) survey results, 33-53 individuals Large-podded Tick-trefoil occur within the study area. An estimated 21-31 individuals occur within the mine surface clearance footprint, which equates to over half of the known population within the study area.

Large-podded Tick-trefoil is a herbaceous perennial scrambler to 0.5 m that is known to be self pollinating (Hacker 1990 as cited in DNR 1999). It normally occurs in open Eucalypt woodlands and open Eucalypt forest communities predominantly on red earths (rarely on sandy clay soils) and has been recorded to 884 m elevation (Queensland Herbarium 1996 as cited in DNR 1999). Populations have been recorded from north of Townsville to near Mundubbera and as far west as Longreach. The closest known populations occur 50 km and 70 km northwest and 120 km east of the study area.

Round-leaved Myrtle (*Micromyrtus rotundifolia*) has been recorded by the Queensland Herbarium in association with hilly terrain to the northwest of the study area. The mine surface clearance footprint does not contain suitable habitat for this species.

No other NC Act Threatened or Near Threatened flora species were identified during the assessment and no flora species listed under the EPBC Act were identified by either the desktop review or the field surveys.

Although it is not possible to rule out the potential occurrence of any EPBC Act listed flora species (or any NC Act Threatened or Near Threatened flora species in addition to the species detailed above), the likelihood of occurrence of such species within the mine surface clearance footprint is considered to be low.

Plate 7. Desiccated Large-podded Tick-trefoil (*Desmodium macrocarpum*) specimen observed in the Bimblebox Nature Refuge.

5.2.4 Regionally Significant Flora Species

Three Regionally Significant flora species were identified by database searches from the wider study area. These include Sandstone Wattle (*Acacia gnidium*) and Broad-leaved Sandstone Myrtle (*Homoranthus thomasii*) listed as significant species within ROTAP (Briggs and Leigh 1995) and Desert Heather (*Calytrix microcoma*) listed as endemic to the Desert Uplands bioregion (EPA 2005). The preferred habitat for each of these species is sandstone scarps. There is potential for these species to occur in the northwestern corner of the study area but not within or adjacent to the mine surface clearance footprint. No other Regionally Significant species were observed within the Study area during the field survey.

5.2.5 Least Concern Flora Species

A total of 85 Least Concern native flora species were recorded during the field surveys (**Appendix 4**).

5.2.6 Significant Weed Species

The study area is generally dominated by blade ploughed and pulled paddocks that contain a high density (> 95%) of pasture grass (primarily Buffel Grass) (e.g. Sites BB19, BB21, B28 and BB29; **Appendix 3**). This environmental weed is also present in open woodland areas but in lower densitied (generally less than 5% cover).

In total eight non-native flora species (**Table 5**) were identified within the study area including three declared weed species:

- Rubber Vine (*Cryptostegia grandiflora*) is a WONS species and a Class 2 declared weed species previously observed near the centre of the Bimblebox Nature Refuge (WorleyParsons 2009). The species is not widespread or common in the study area.
- Velvet Tree Pear (*Opuntia tomentosa*) is a Class 2 declared weed that occurs as scattered individuals across the study area (and in the majority of the sites surveyed).
- Arsenic Weed (*Senna obtusifolia*) is a Class 2 declared weed that occurs in isolated small patches across the study area.

Table 5. List of Non-native Flora Species Recorded During Field Surveys

Scientific name	**Common name**
*Cryptostegia grandiflora**^	Rubber Vine
*Opuntia tomentosa**	Velvet Tree Pear
*Senna obtusifolia**	Arsenic Weed
Pennisetum ciliare[#]	Buffel Grass
Melinis repens	Natal Grass
Dactyloctenium australe	Durban Grass
Stylosanthes scabra	Shrubby Scabra
Hymenachne amplexicaulis	Olive Hymenachne

* Declared

^ WONS

[#]Pasture grass

5.3 Fauna Environment

5.3.1 Fauna Habitat Values

Overall, biological values in the study area were found to be low, due to the highly disturbed and degraded nature of most habitats (i.e. a large proportion of the area consists of blade-ploughed Buffel Grass pasture) (**Appendix 5**). However, a few areas show important fauna habitat values and these are discussed below.

Three fauna habitat types were identified as being present within the study area (Open woodland, riverive and Buffel Grass pasture; **Figure 4**).

Open Woodland Habitats

The majority of woodland habitats are Eucalypt woodlands but also include some Acacia woodlands.

Open woodland habitats occupy approximately 30% of the study area (and approximately 18% of the mine surface clearance footprint) and are distributed across the majority of the study area (with the exception of the north eastern portions). Relatively large areas of open woodland habitats adjoin the study area on all sides (**Figure 4**).

The open woodland habitats can be further broken down into the following three sub-areas.

Bimblebox Nature Refuge

The Bimblebox Nature Refuge is managed for conservation and beef production purposes as part of the cattle grazing enterprise conducted by Glen Innes Station. The vegetation in this area was found to range from average to very good condition with evidence of grazing, clearing for tracks, Buffel Grass invasion and patches of dieback present in varying degrees.

The Refuge is mostly dominated by Silver-leafed Ironbark open woodland on sandplains (RE 10.5.5) which is identified by Morgan *et al.* (2002) as an area of species biodiversity with habitat values for a variety of fauna, and particularly for woodland birds. The mature woodlands in the Refuge include individual large habitat trees with hollows suitable for use by arboreal mammals, bats and birds. The trees provide bark habitats as well as contributing fallen logs and branches to the ground layer. However, the fallen timber is very sparsely distributed which may limit the habitat value for mammals and reptiles which are dependent on woody debris.

Generally, the Refuge has a sparse shrublayer to 1 m tall although it is dense in some areas where it provides good habitat for small insectivorous birds.

The ground layer generally has limited Buffel Grass content (mostly <5%) and supports a relatively intact, dense understorey of native grasses which provides habitat niches for a number of reptile and mammal species.

Current research being conducted in the Refuge includes rangeland assessment and monitoring by CSIRO Sustainable Ecosystems and the Queensland Herbarium has a number of permanent monitoring sites in the refuge to study the effects of Buffel Grass invasion into natural systems and also ecological processes including fire dynamics (E. Vanderduys pers. comm and R. Fensham pers. comm.).

Cavendish Area

Woodlands in the Cavendish property to the west of the Bimblebox Nature Refuge also have relatively high conservation values with generally similar plant species and fauna to those found to occur in the Bimblebox Nature Refuge. Although Buffel Grass may be more widespread in this area than in the Bimblebox Nature Refuge, the field survey concluded that conservation values in the Cavendish area were also high.

This habitat is generally in very good condition (**Appendix 5**) and is composed mostly of Lancewood, Silver-leaved Ironbark, and Poplar Box open woodland. The understorey is made up of shrubs and grasses. Logs are present and tree hollows are in relatively high abundance.

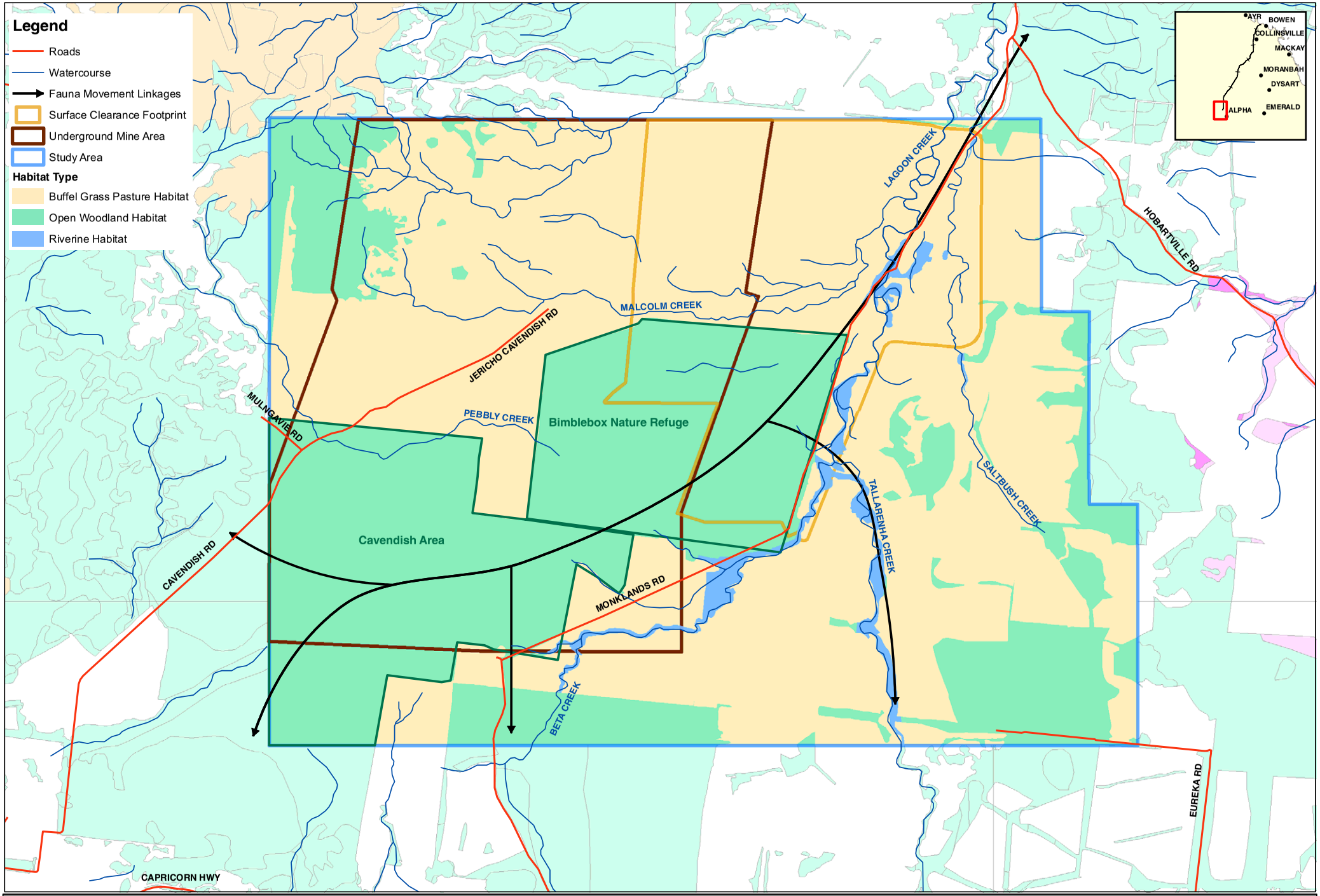

FIGURE 4: FAUNA HABITAT TYPES AND LINKAGES

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Umwelt Group Pty Ltd does not guarantee the accuracy or completeness of the map and does not make any warranty about the data.
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Sandstone Escarpment

This area consists mostly of Eucalypt open woodlands (e.g. Yellowjacket, *E. similis*; Ironbark, *E. exilipes*; Box, *E. populnea* and *E. thozetiana*) with patches of Lancewood woodland and occurs in the north west of the study area. The two sites assessed in nearest proximity to the mine surface clearance footprint (i.e. BB06 and BB26) were found to be in average condition (**Appendix 3**).

Riverine Habitat (Lagoon Creek)

The riverine habitats in the eastern edge of the study area, although heavily grazed and with an understory dominated by Buffel Grass, were found to have habitat value for mobile species such as bats and some birds, and also species closely associated with the larger riverine trees, such as Brushtail Possums and hollow nesting birds.

Lagoon Creek in particular, supports tracts of remnant vegetation (RE 10.4.3 / 11.3.27) including extensive linear strips of mature River Red Gums that fringe ephemeral and semi-permanent waterholes. This habitat contains a high proportion of large tree-hollows. The aquatic habitat values associated with this site are described in a separate technical report for the EIS.

Buffel Grass Pasture Habitat

The majority of the study area and mine surface clearance footprint consists of cleared, grazing lands that support a monoculture of Buffel Grass. Occasional shrubs and trees occur along fencelines and in some drainage depressions. The areas are mapped by DERM as non-remnant.

Night spotlight surveys in the Buffel Grass pasture habitat north of the Bimblebox Nature Refuge identified Spectacled Hare-wallabies (*Lagorchestes conspicillatus*) and Rufous Bettongs (*Aepyprymnus rufescens*) feeding in this area, two Regionally Significant species (see **Section 5.3.4**). The Australian Bustard, also of conservation significance, was recorded in this area. Other than these records, the Buffel Grass Pasture habitat was found to support several common bird species. No native reptiles, frogs or other small mammals were recorded.

5.3.2 Connectivity

The largest tract of intact native vegetation in the study area is the joint Cavendish area / Bimblebox Nature Refuge. This area is not identified by the BPA (EPA 2005) as a significant wildlife corridor. Overall, connectivity values of these woodlands to areas other than to the west and south west are considered to be low, due to lack of adjoining native vegetation in all other directions. Lagoon Creek to the east provides some limited connectivity value for relatively mobile species including birds, bats and larger mammals. **Figure 4** shows some of the existing fauna linkages across the study area.

5.3.3 Threatened and Near Threatened Fauna Species

The review of information available revealed a total of 9 Threatened and Near Threatened fauna species (as well as an additional 12 species that are not Threatened or Near Threatened but are listed under the EPBC Act as Marine and / or Migratory fauna species) as potentially occurring across the study area. The species have been recorded from, or may potentially utilise habitat, within the broader area (**Table 6**). They comprise three reptiles, six birds and one mammal. The habitat assessment identified that the mine surface clearance footprint contains preferred habitat for five of these species.

The Endangered (NC Act listed) Troughton's Sheathtail-bat (*Taphozous troughtoni*) was tentatively recorded (ultrasonic recording) within the Bimblebox Nature Refuge by WorleyParsons (2009) on the basis of echolocation call analysis. The calls of this species are very similar to those of a free-tail bat, *Mormopterus sp.3*. and since there are no cave formations within the local region (roosting habitat for *Taphozous*), it is most likely that all echolocation call records are

attributable to this latter species which is not listed as threatened under any legislation. Further, preliminary genetic investigations suggest that the name *T. troughtoni* is synomymous with the common and widespread *Taphozous georgianus* in Queensland. For these reasons, the species has been excluded from this report.

An unconfirmed sighting of Squatter Pigeon (*Geophaps scripta scripta*) was made in the Bimblebox Nature Refuge. This Vulnerable (NC Act and EPBC Act listed) species is likely to occur within the study area and has been reported to occur in the area (E. Vanderduys pers. comm.).

No other Threatened or Near Threatened fauna species were recorded during the field survey.

The following table presents a list of Threatened, Near Threatened and Migratory fauna species that have been identified as occurring or potentially occurring across the study area. It also presents a description of preferred habitat for each species and an assessment of whether this habitat occurs within or adjoining the mine surface clearance footprint.

Table 6. Threatened, Near Threatened and Migratory Fauna Species Potentially Present Within the Study Area

Common Name	Scientific Name	Status		Preferred Habitat	Source	Preferred habitat present within or adjoining the mine surface clearance footprint
		NC Act	EPBC Act			
Reptile						
Yakka Skink	*Egernia rugosa*	V	V	Poplar box, ironbark, Brigalow, white cypress pine, mulga, bendee and lancewood woodlands, open forests. Substrates include rock, sand, clay and loamy red earth.	1	Yes
Dunmall's Snake	*Furina dunmalli*	V	V	Brigalow forest and woodland with fallen timber and ground litter, growing on cracking clay soils and clay loam soils.	1	No
Brigalow Scaly-foot	*Paradelma orientalis*	V	V	Sandstone ridges in woodlands and vine thickets, and in open forests and woodlands, especially ironbark, cypress pine, Brigalow, bull oak, spotted gum and vine scrubs.	1	No. Distributional range is further south.
Bird						
Fork-tailed Swift	*Apus pacificus*	-	Mi	Summer migrant. Aerial insectivore.	1	Yes
Great Egret	*Ardea alba*	-	Mi	Widespread species – common.	1	Yes
Cattle Egret	*Ardea ibis*	-	Mi	Widespread species – common.	1	Yes
Horsfield's Bronze-Cuckoo	*Chalcites basalis*	-	Mi	Found in many wooded habitats (such as open and dry woodland and forest) with a range of understoreys from grasses to shrubs or heath.	6	Yes
Latham's Snipe	*Gallinago hardwickii*	-	Mi	Marshes and swamps in tall grass.	1	Yes

Common Name	Scientific Name	Status		Preferred Habitat	Source	Preferred habitat present within or adjoining the mine surface clearance footprint
		NC Act	EPBC Act			
Squatter Pigeon (southern)	*Geophaps scripta scripta*	V	V	Patchy distribution in dry eucalypt forest, often near water. Locally extinct in former southerly parts of its range (southern Queensland / North New South Wales).	1	Yes
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	-	Mi	In association with large, permanent water bodies. Not known from study area.	1	No
White-throated Needletail	*Hirundapus caudacutus*	-	Mi	Migrant, occasionally found in airspace over study area only.	1	Yes
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V	-	Arid and semi-arid interior of Australia. Wide range of treed and treeless inland habitats, always within easy reach of water.	4	No (outside currently known distribution)
Black-chinned Honeyeater	*Melithreptus gularis*	NT	-	Grassy woodland dominated by eucalypts, paperbarks or acacias, where there is access to seeding grasses and water.	4	Yes
Rainbow Bee-eater	*Merops ornatus*	-	Mi	Variety of habitats where it takes insects in flight. May breed in sand banks of creeks and rivers.	1	Yes
Star Finch (eastern)	*Neochmia ruficauda ruficauda*	E	E	Open grasslands and eucalypt woodlands. Along creeks and streams in reeds and tall grasses. Locally extinct at several sites such as Blackall in central Qld (Higgins *et al.* 2006; Holmes 1996) and in the former southern areas of its range (New South Wales).	1	No
Southern Boobook	*Ninox novaeseelandiae*	-	Mi	Southern Boobooks are seen in a variety of habitats from dense forest to open desert.	6	Yes

Common Name	Scientific Name	Status		Preferred Habitat	Source	Preferred habitat present within or adjoining the mine surface clearance footprint
		NC Act	EPBC Act			
Little Curlew	*Numenius minutus*	-	Mi	Coastal and inland grasslands and black soil plains in northern Australia, near swamps and flooded areas.	1	Yes
Black-throated Finch (southern)	*Poephila cincta cincta*	E	E	Eucalypt woodland and riverside vegetation, including paperbark and wattle shrubland.	1	Yes
Australian Painted Snipe	*Rostratula australis*	V	V	Occurs over much of eastern Australia where it favours freshwater swamps and samphire salt marshes (Morcombe, 2000).	1	Yes
Channel-billed Cuckoo	*Scythrops novaehollandiae*	-	Mi	Found in tall open forests, usually where host species occur.	6	Yes
Sacred Kingfisher	*Todiramphus sanctus*	-	Mi	The Sacred Kingfisher inhabits woodlands, mangroves and paperbark forests, tall open eucalypt forest and melaleuca forest.	6	Yes
Mammal						
Northern Quoll	*Dasyurus hallucatus*	-	E	Prefer rocky areas and eucalypt forests.	1	No

Status: [1]: Commonwealth (EPBC) listed: **E** = Endangered; **V** = Vulnerable;

[2]: State (NC Act) listed: **E** = Endangered; **V** = Vulnerable; **R** = Rare.

Source: **1** = EPBC Protected Matters Search; **2** = QEPA WildNet record; **3** = Queensland Museum (QM) record; **4** = Bird data online; **5** = WorleyParsons (2009); **6** = Mackay Conservation Council (2009).

EPBC = Listed status under the EPBC Act: **Mi** = Migratory Species.

* Taxonomic debate about whether this is a separate species to the widespread and common Sheathtail-bat. Tentative identification only.

5.3.4 Regionally Significant Fauna Species

According to database searches, 46 Priority Species listed under BAMM for the Desert Uplands (Criteria H) (EPA 2005) may potentially occur within or in the broad vicinity of the study area (**Appendix 6**).

Eleven Regionally Significant fauna species (**Table 7**) were observed within the Study area during the field survey.

Table 7. Regionally Significant Fauna Species Recorded in the Study Area

Common Name	Scientific Name	Number of Records
Frog		
Great Brown Broodfrog	*Pseudophryne major*	1
Bird		
Australian Bustard	*Ardeotis australis*	4
Bush Stone-curlew	*Burhinus grallarius*	1
Brown Treecreeper	*Climacteris picumnus*	2
Hooded Robin	*Melanodryas cucullata*	2
Grey-crowned Babbler	*Pomatostomus temporalis*	3
Mammal		
Rufous Bettong	*Aepyprymnus rufescens*	8
Spectacled Hare-wallaby	*Lagorchestes conspicillatus*	2
Desert Mouse	*Pseudomys desertor*	4
Common Brushtail Possum	*Trichosurus vulpecula*	3
Swamp Wallaby	*Wallabia bicolor*	1

Great Brown Broodfrog

This species was recorded once in a pitfall trap at site BB01 within the Bimblebox Nature Refuge. This frog lives in forests and heathlands where it builds burrows in damp areas under rocks, logs and leaf litter (Barker *et al*. 1995)

Australian Bustard

This species was recorded during bird transects on four occasions in grasslands, but most commonly in association with watercourses (i.e. Lagoon Creek).

While open habitats such as tussock grasslands, Triodia hummock grasslands, grassy woodlands and low shrublands are preferred habitats for the species, Australian Bustards typically seek the edges of denser more protective shrublands and woodlands to lay usually a single egg on the ground (Marchant and Higgins 1993).

Bush Stone-curlew

The Bush Stone-curlew was observed on one occasion where Lagoon Creek joins the Bimblebox Nature Refuge. This species is usually found in open forests and woodlands, near watercourses or swamps (Johnson and Baker-Gabb 1994; Keith 2004).

Brown Treecreeper

This species was observed on two occasions, both within the Bimblebox Nature Refuge. This species inhabits forests, woodlands and shrublands, especially where there are stands of dead trees, abundant fallen timber, or both (Noske 1979).

Hooded Robin

This species was observed twice during bird transects, both observations were made within the Bimblebox Nature Refuge. It prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas (ACT Government 2004).

Grey-crowned Babbler

This species was recorded three times; twice within the Bimblebox Nature Refuge and once in the woodland of the Cavendish area. The Grey-crowned Babbler inhabits open Box / Gum Woodlands on slopes, and Box / Cypress-pine and open Box Woodlands on alluvial plains (Garnett and Crowley 2000).

Rufous Bettong

The Rufous Bettong was the most commonly observed Regionally Significant mammal species with eight records. All records were associated with riparian habitats and watercourses. They were observed at night during spotlighting, along roadside in the grassy areas adjacent to riparian habitats in the east of the study area. This species inhabits a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter (Strahan 1995).

Spectacled Hare-wallaby, Common Brushtail Possum, Swamp Wallaby

These species were observed at night along roadsides in the grassy areas, generally within short distances of trees.

Desert Mouse

A total of four individuals were recorded from both Elliott traps and pitfall traps. Three specimens were recorded in the Bimblebox Nature Refuge and one specimen from the Cavendish area.

The Desert Mouse, shown in **Plate 8**, occurs in a wide range of sub-tropical savanna woodland, shrubland and grassland vegetation types. However, perennial native ground cover, such as *Triodia* spp., has been identified as key habitat for this species where highest abundances have been recorded (Kutt *et al*. 2004). Both grazing and fire are known to cause significant decline of the Desert Mouse (Kutt *et al*. 2004; Kutt and Woinarski 2007).

Plate 8. Desert Mouse (*Pseudomys desertor*) specimen, which was caught in Elliott trap.

5.3.5 Vertebrate Fauna Recorded During Field Survey

A total of 130 vertebrate species were recorded during the field survey. This includes five amphibians, 15 reptiles, 88 birds and 22 mammals (**Appendix 7**). Among the mammal species recorded, a total of nine bat taxa were identified (see **Appendix 8** for more details).

With the exception of one amphibian species (Cane Toad, *Bufo marinus*) and three mammal species (Cat, *Felis catus*; Rabbit, *Oryctolagus cuniculus* and Cattle, *Bos taurus*), all of the species recorded are native species currently listed as 'Least Concern' wildlife under the NC Act.

The following table summarises the number of vertebrate records and species per habitat area.

Table 8. Number of Vertebrate Records and Species Per Habitat Type and Area

Habitat Type and Area	Open Woodland		Riverine (Lagoon Creek)	Buffel Grass pasture	Grand Total
	(Bimblebox Nature Refuge)	Woodland (Cavendish area)			
Total number of records	158	52	81	86	377
Total number of species	93	63	54	40	130

Overall, both the numbers of verterbrate records and number of species recorded were higher in the Open Woodland than in the riparian or Buffel Grass pasture.

The number of vertebrate records and number of species recorded was highest in the Bimblebox Nature Refuge than in the Cavendish area but this variation is likely to be due, at least partially, to the extra sampling effort which occurred in the Bimblebox Nature Refuge (which was sampled in both the dry and wet seasons whereas other surveys outside the Refuge only occurred in the wet season).

The species diversity in the Cavendish area is also relatively high, considering the much lower number of total records obtained from this area. Species such as the Desert Mouse, which are particularly affected by habitat quality (occurring principally in association with spinifex; Cole and Woinarski 2002) were also recorded in this area. It was observed that grazing pressure might have been greater in this area in comparison to the Bimble Box Nature Refuge (although this was not quantified) and this may have influenced species richness, although the effect is probably minor.

The riverine habitat recorded a number of species that are associated with eucalypt forest environments, such as Brushtail Possums and Lorikeets. These species were not recorded elsewhere. Records along the riverine habitat also included many aquatic birds such as ducks and herons. The aquatic biodiversity of the riverine habitats is described in a separate technical report for the EIS.

The Buffel Grass pasture habitats recorded the lowest number of species and many of these were ubiquitous and resilient species that adapt readily to altered environments, such as Torresian Crows, Zebra Finch, and other species often associated with open grasslands such as the Australian Bustard, Red and Eastern Grey Kangaroos, Masked Lapwings and Emus. Pitfall and funnel traps set in this environment only recorded frogs (e.g. Desert Tree Frog, Ornate Burrowing Frog and Green Tree Frog).

5.3.6 Introduced Fauna

Four common introduced species were recorded from the study area (i.e. Cane Toad, Cat, Cattle and Rabbit). These species occur widely within the local district and two of them are declared animals listed under the LP Act (Rabbit and Cat).

5.4 Wetlands

There are no Nationally Important Wetland nor Wetlands of International Importance (Ramsar sites) within and / or in the vicinity of the study area.

The DERM Queensland Wetland Mapping identifies several freshwater palustrine and lacustrine wetlands within the study area. These wetlands are identified as being watercourses that are fringed with RE 10.3.14 and RE 10.3.15.

These watercourses are commonly ephemeral creeks and several sections of Lagoon Creek which contain temporary / semi-permanent waterholes, which are fringed with mature red gums (See **Section 5.3.1**).

These riparian waterholes are not suitable for hosting breeding or significant congretations of migratory or nomadic birds. A detailed assessment of the aquatic values associated with these watercourses is provided in a separate technical report to the EIS.

6.0 Potential Impacts During Construction

The construction and operation of the mine have the potential to impact the terrestrial ecology of the area. The following section discusses these potentential impacts and identifies the likelihood of occurrence (L) and the potential consequence of these impacts (C) using the risk matrix presented in **Section 5.3**.

6.1 Significance of Construction of the Mine in a State, Bioregional and Local Context

The potential impacts to terrestrial flora and fauna values associated with the construction of the mine are detailed in the following sections. As detailed below, there is potential to have High (8) impacts at a regional level on two Least Concern Regional Ecosystems (detailed in **Section 6.3**) and High (8) impacts at a state level on a Near Threatened flora species (Large-podded Tick-trefoil) will be unavoidable (**Section 6.5**).

Within the Desert Upland bioregional context, the mine clearance footprint would require the unavoidable removal of approximately 4,595 ha of Least Concern remnant vegetation, which represents approximately 0.3% of the remnant vegetation in the Bioregion (and less than 0.3% of all except one affected RE type proposed to be cleared). This includes clearance of approximately 1.65% of RE 10.3.27 which is classified as Of Concern under its DERM Biodiversity Status clearance (**Section 6.3**). This clearing represents a High (8) impact for this RE.

The footprint includes 52% of the Bimblebox Nature Refuge (an area identified by DERM as a Category C Environmentally Sensitive Area). Whilst for the Bimblebox Nature Refuge the direct impact of clearing has been determined to be High (9), for Threatened and Near Threatened, Migratory and most Regionally Significant fauna species, this proposed clearance represents a proportionally minor reduction in spatial extent of suitable habitats (detailed below) that are extensively represented in the local area and other parts of the bioregion. As described in **Section 6.10**, the construction of the mine has the potential to have a High (8) impact on one Regionally Significant fauna species (*Pseudomys desertor,* Desert Mouse).

As detailed in **Section 8**, Waratah Coal is, subject to landholder approval, willing to develop potential offset rehabilitation linkages between the Bimblebox Nature Refuge and currently unconnected remnant vegetation areas to the northwest and partially connected remnant vegetation to the west (**Figure 5**). The connection to the open eucalypt and lancewood woodlands upon the sandstone escarpment northwest would provide the benefit of forming a linkage across the topographical elements of the landscape. The linkage would greatly enhance connectivity between Lagoon Creek and the open eucalypt woodlands of the Bimblebox Nature Refuge to the woodlands on the slopes and the crest of the sandstone escarpment. The woodlands of the sandstone escarpment are part of a large north-south remnant vegetation belt which extend for approximately 70 km to the north and include the Cudmore National Park. Improved connectivity of the Bimblebox Nature Refuge to this large vegetation belt would have a positive effect on the biodiversity of the Refuge and wider landscape.

These offsets would have the potential to reduce the likelihood of the impacts on many terrestrial flora and fauna species including the Desert Mouse as well as provide some compensation for the unavoidable impacts from clearing.

The potential impacts to terrestrial flora and fauna values associated with the construction of the mine have been determined to be Medium (5) significance within the local context. The mine surface clearance footprint would require removal of approximately 7% of the remnant vegetation within a 10 km buffer.

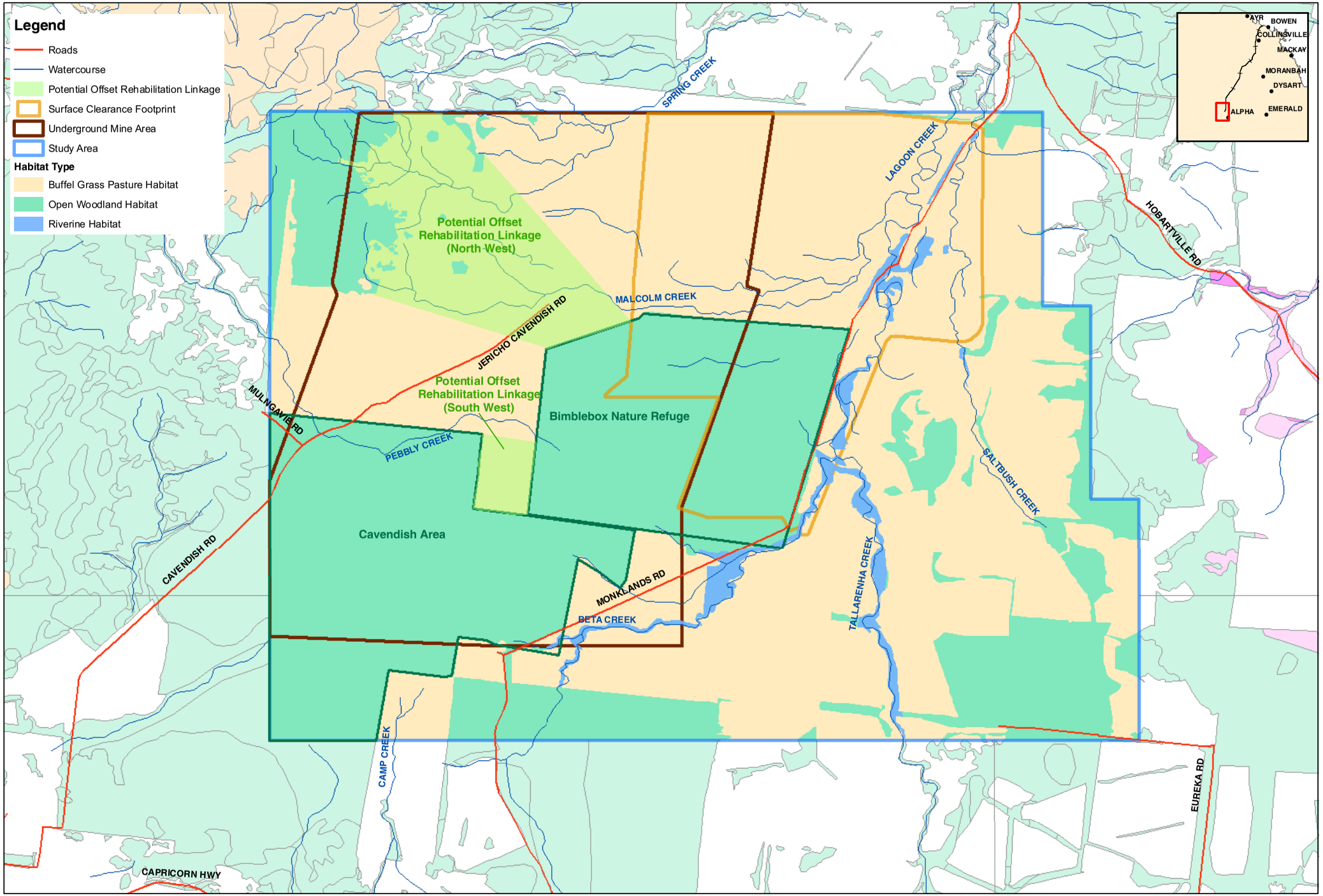

FIGURE 5: POTENTIAL OFFSET REHABILITATION LINKAGES

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The mine will require diversion of Lagoon Creek and clearing of the associated riparian habitats. Removal of these habitats, and the limited level of fauna movement connectivity that they currently provide, has been determined to be a Medium (5) impact in the local context. Development of the potential offset rehabilitation linkages have the potential to compensate for a significant portion of the local terrestrial flora and fauna impacts potentially associated with the mine construction.

Approximately 77 ha of RE 10.3.12 is proposed to be cleared, which equates to 44% of the amount of that remnant estimated to occur within a 10 km buffer. This potential impact has been determined to be High (8) for this RE in the local context.

6.2 Potential Impacts of Construction on Flora in General

The majority (69%) of the mine surface clearance footprint encompasses areas of cleared non-remnant vegetation (i.e. pasture land). However, the southern and eastern portions of this footprint are located within VM Act Least Concern eucalypt woodlands as well as riparian vegetation associated with Lagoon Creek. No EPBC Act or VM Act listed ecological communities / REs are required to be cleared.

In all, approximately 4,595 ha of remnant vegetation is proposed to be cleared. This represents approximately 7% of the entire vegetation extent within a 10 km buffer and 0.3% of that which occurs in the Desert Uplands bioregion (**Table 9**).

Potential direct and indirect impacts to flora associated with the proposed clearing include:

- Direct spatial reduction in remnant vegetation due to clearing (detailed below);
- Increased edge effects within the Bimblebox Nature Refuge (through reducing the edge to area ratio and moving the edge) including the potential to increase the abundance of Buffel Grass and other weeds;
- Potential for increased fire intensity if Buffel Grass densities within the Bimblebox Nature Refuge are increased;
- Potential for dust to reduce the health of retained vegetation in the vicinity of the clearance footprint;
- Potential for temporary facilities, materials and equipment to damage areas outside the construction footprint;
- Potential to alter the hydrological characteristics for areas adjoining and downstream of the mine; and
- Potential for accidential and inappropriate release of pollutants.

6.3 Potential Impacts on Threatened Ecological Communities

6.3.1 Potential Impacts on EPBC Threatened Ecological Communities

There are no vegetation communities within the study area that are listed under the EPBC Act. As such, no impacts are expected.

6.3.2 Potential Impacts on 'Endangered' REs

No VM Act Endangered REs are required to be cleared or will be impacted by the mine surface clearance footprint.

Two REs classified as Endanged under the DERM Biodiversity Status classification occur within the footprint. The estimated clearing extent is 13.4 ha of RE 10.4.3 and 0.08 ha of RE 10.3.25. The proportion of these REs that this clearing would represent is 0.19% (RE 10.4.3) and <0.01% (RE 10.3.25) of that which occurs in the Bioregion. This clearing is unavoidable (L = 5) and will have a minor (C = 2) consequence for these REs within a bioregional context. As such, it represents a Medium (5) impact on these REs. Mitigation measures to minimise these impacts are provided in **Section 8**.

6.3.3 Potential Impacts on 'Of Concern' REs

No VM Act Of Concern REs are required to be cleared or will be impacted by the mine surface clearance footprint.

Two REs classified as Of Concern under the DERM Biodiversity Status classification occur within the mine surface clearance footprint. The estimated clearing extent is 1,172 ha of RE 10.3.27 and 11.3 ha of RE 10.3.4. The proportion of these REs that this clearing would represent is 1.65% (RE 10.3.27) and 0.07% (RE 10.3.4) of that which occurs in the Bioregion and 14% and 0.58% within 10 km. This unavoidable (L = 5) clearing will have a moderate (C = 3) consequence for RE 10.3.27 (and minor (C = 2) for RE 10.3.4) and represents High (8) and Medium (5) impacts respectively for these Res at the local level. Mitigation measures to minimise these impacts are provided in **Section 8**.

6.3.4 Potential Impacts on 'Least Concern' REs

The estimated clearing footprint within each of the affected Least Concern REs is shown in **Table 9**.

Table 9. Estimated Clearing Requirements Within Least Concern REs

REs	Clearing extents (ha)*	Extent within 10 km buffer	% within 10 km buffer	Clearing extent within Bioregion	% within Bioregion
10.3.12a	77.09	175.48	43.93	32,853.64	0.23
10.3.25	0.08	113.88	0.07	11,199.77	<0.01
10.3.27a	1,172.29	8,533.12	13.74	71,031.29	1.65
10.3.28a	128.30	2,130.14	6.02	273,761.32	0.05
10.3.3	40.01	957.41	4.18	31,640.90	0.13
10.3.4b	11.26	1,927.30	0.58	16,810.99	0.07
10.4.3	13.54	185.44	7.30	7,109.01	0.19
10.5.12	315.28	7,319.61	4.31	138,918.13	0.23
10.5.5a	2,836.78	44,441.47	6.38	937,744.75	0.30
11.5.5	0.06	927.93	0.01	927.93	0.01
TOTAL	**4,594.68**	**66,711.78**	**6.89**	**1,521,997.73**	**0.30**

* estimates based on existing DERM RE mapping

For the majority of these Least Concern REs the extent of clearing is relatively small in comparison to their local (<10%) and bioregional (<0.1%) occurrence. As such the unavoidable (L = 5) impact of the clearing on these REs is of minor (C = 2) consequence and has been determined to be Medium (6) at both local and regional levels. Mitigation measures to help minimise these impacts are provided in **Section 8**.

Exceptions where a more significant portion of the local and bioregional occurrence are proposed to be cleared are RE 10.3.12 and RE 10.2.27a. The proposed clearing of 1,172 ha of RE10.3.27a represents approximately 14% of that which occurs within the 10 km buffer and approximately 1.65% of that occurring in the bioregion. Approximately 77 ha of RE 10.3.12 is proposed to be cleared, which equates to 44% of the amount of that remnant estimated to occur within a 10 km buffer. Localised impacts have been determined to be High (8) for these REs. Mitigation measures to minimise these impacts are provided in **Section 8**.

6.4 Potential Impacts on Threatened and Near Threatened Flora Species

Five populations of Large-podded Tick-trefoil are known to occur within the study area.

Potential direct and indirect impacts associated with construction of the mine on this Near Threatened flora species include:

- Direct loss of individuals through clearing activities. Approximately 21-31 individuals will be removed. This represents over half of the known plants (33-53 individuals; WorleyParsons 2009) in the vicinity.
- Reduction in the long term viability of the local population by removing approximately 40% of the known individual plants. Although there is no known study on the long term viability of the Large-podded Tick-trefoil, population reduction and increased spatial isolation of plant populations generally result in decreasing genetic variation (Young *et al.* 1996).
- Direct loss of potential habitat, with approximately 3,926 ha of potential habitat proposed to be removed.
- Potential to affect health and viability of plants outside the clearance footprint through:
    - Increased edge effects and associated potential to increasing the abundance of Buffel Grass and fire intensity;
    - Potential for dust to reduce the health of plants and associated vegetation retained outside the construction footprint;
    - Potential for temporary facilities, materials and equipment to damage plants and associated vegetation outside the construction footprint.

The unavoidable (L = 5) direct impacts of removing over half of the known individual plants in the local population are of moderate (C = 3) consequence and unmitigated, the indirect impacts could potentially be major (C = 4) (threatening the locally known occurrence of the species). As such, the potential impact on Large-podded Tick-trefoil is High (9). Mitigation measures to help minimise the impacts upon Large-podded Tick-trefoil are provided in **Section 8**.

Acacia spania and *Micromyrtus rotundifolia* (NC Act Near Threatened and Vulnerable, respectively) occur sufficiently distant from the footprint that no impact upon these species is likely.

No other Threatened or Near Threatened flora species were located during the assessment. It is possible but unlikely that any other Threatened or Near Threatened flora species occur within or adjoining the footprint in significant numbers. Therefore no significant impacts are anticipated for any Threatened or Near Threatened flora species with the exception of Large-podded Tick-trefoil.

6.5 Potential Impacts on Environmentally Sensitive Areas

The mine site is remote from and unlikely to have any impact upon any Category A Environmentally Sensitive Area.

No VM Act Endangered REs are required to be cleared or will be impacted by the mine.

Two REs classified as Endangered under the DERM Biodiversity Status classification occur within the mine clearance footprint (**Figure 3**). The estimated clearing extent is 13.4 ha of RE 10.4.3 and 0.08 ha of RE 10.3.25. The proportion of these REs that this clearing would represent is 0.19% (RE 10.4.3) and <0.01% (RE 10.3.25) of that which occurs in the Bioregion. The need to clear these patches is still to be finalised, however, it is likely that at least some portions will be unavoidable (L = 5). The consequence is minor (C = 2) and the impact has been determined to be Moderate (3) for these REs in a regional context. Mitigation measures to avoid and minimise these impacts are provided in **Section 8**.

The mine surface clearance footprint overlaps with the Bimblebox Nature Refuge, which is classified as a Category C Environmentally Sensitive area.

The potential impacts on the Refuge associated with the construction of the mine include:

- Direct spatial reduction in extent. It is estimated that approximately 3,926 ha of remnant vegetation will be cleared within the Bimblebox Nature Refuge as a result of the project construction. This figure equates to approximately 52% of the Refuge's existing remnant vegetation extent (7,526 ha);

- Increased edge effects within the Bimblebox Nature Refuge (through reducing the edge to area ratio and moving the edge) including the potential to increase the abundance of Buffel Grass (and other weeds) and the associated potential for increased fire intensity;

- Potential for dust to reduce the health of retained vegetation in the vicinity of the clearance footprint; and

- Potential for temporary facilities, materials and equipment to damage areas outside the construction footprint.

The unavoidable (L = 5) direct impacts associated with the clearing represent a major (C = 4) consequence for the Nature Refuge and has been determined to be a High (9) impact. Mitigation measures to help minimise the indirect impacts are provided in **Section 8**. As detailed in **Section 8**, Waratah Coal is, subject to landholder approval, willing to develop potential offset rehabilitation linkages between the Bimblebox Nature Refuge and currently unconnected remnant vegetation areas to the northwest and west (**Figure 5**). These offsets would have the potential to compensate for some of the terrestrial flora and fauna impacts on the Bimblebox Nature Refuge.

6.6 Potential Impacts Associated with Declared and Other Weeds

The construction of the mine has the potential to spread existing declared, environmental and other weeds and introduce new weed species to the area.

Introduction and spread of declared weeds can render land less productive and in some cases have serious health impacts on livestock and people. Parthenium Weed (*Parthenium hysterophorus*) is of particular interest to landholders and the community due to its potential

impacts on agricultural productivity and human health. Parthenium Weed is not currently known within the study area.

Of the three declared weeds that are known to occur in the study area (Rubber Vine, Prickly Pear and Arsenic Weed), there is potential for the mine activities to spread these into currently clean areas through earthworks, movement of vehicles, machinery, equipment, materials and fill. All three species have the potential to cause agricultural and environmental degradation, particularly in alluvial soil areas (Land Zone 3).

The mine activities also have the potential to spread environmental weeds into the adjoining woodlands and riparian areas where they do not currently occur. There is potential for the density and prevalence of Buffel Grass within the Binblebox Nature Refuge to be increased through edge effects and increased traffic. This species is an introduced and highly valued pasture grass in many areas; however, it has the potential to out-compete native groundcover species. It has the potential to cause an increase in biomass which biases fire regimes towards much more intense and frequent fire events which could degrade the adjoining eucalypt woodlands. The grass itself also provides very little nutritive or forage value for wildlife and therefore areas dominated by the Buffel Grass can become less biodiverse.

Potential impacts associated with introduction and spread of weeds are possible (L = 3) and could have moderate (C = 3) ecological consequences for adjoining remnant vegetation areas. As such, these potential impacts have been determined to be Medium (7). Recommendations aimed at controlling the introduction and spread of weed species are provided in **Section 8**.

6.7 Potential Impacts on Fauna in General

Potential direct and indirect impacts on fauna are likely to include the following:

- Loss of habitat such as mature vegetation, hollow-bearing trees and fallen logs, and therefore loss of nesting, refuge and foraging resources;
- Mortality;
- Habitat fragmentation and loss of connectivity (disturbance to fauna movement corridors);
- Barrier effects; and
- Edge effects.

The significance of these impacts on Threatened, Near Threatened, Migratory and Regionally Significant fauna species is considered in **Section 6.8** – **6.10**. The potential impacts on Least Concern fauna species as a group are largely unavoidable (L = 5) and will be of minor (C = 2) significance to these species. As such the impacts on Least Concern fauna as a group are Medium (6).

Loss of habitat

Clearing of remnant vegetation inevitably results in habitat loss for wildlife fauna species.

An important potential impact on fauna is the loss of hollow-bearing trees. A large number of Australian vertebrate fauna species are dependent on tree hollows for shelter and nesting, including (amongst others) parrots, owls, possums, gliders and bats (Gibbons *et al.* 2002). Within the study area large habitat trees (e.g. mature river gums) were observed, in particular, along Lagoon Creek.

Additionally, fallen logs and dead timber on the ground and understorey vegetation provide shelter (either underneath timber or within hollow logs) and food resources for a broad range of small ground-dwelling fauna. These include, but are not exclusive to, native rodents, dasyurids, bandicoots, lizards, snakes, frogs, and some birds. Fallen logs and dead timber mostly occur in the riverine habitat (Site FF05, FF06) and in lesser quantity in both the Cavendish woodland and Bimblebox Nature Refuge (**Appendix 6**).

The loss of remnant vegetation in the Bimble Box Nature Refuge, particularly the loss of intact native understorey components, including spinifex, will result in a direct loss of high value habitat for species that are dependant upon relatively undisturbed habitats. This includes the Desert Mouse and various woodland bird species and possibly some reptiles.

Mortality

Fauna injury or death has the greatest potential to occur during the start-up phase of construction when vegetation and habitats are being cleared. While some mobile species, such as birds, may be able to move away from the path of clearing, other species that are less mobile, or those that are nocturnal, restricted to tree hollows and / or burrowing species, could find it difficult to escape direct impacts.

Habitat Fragmentation and Loss of Connectivity

The areas proposed to be cleared do not currently provide strong connectivity because they are principally joined on one side by remnant vegetation (Cavendish area). Weaker connectivity may occur along Lagoon Creek riverine environments, which are intensively grazed and fragmented through partial clearing. Connectivity of the southern parts of the Bimblebox Nature Refuge with adjoing remnant vegetation areas to the south west will remain unaffected.

As detailed in **Section 8**, Waratah Coal is, subject to landholder approval, willing to develop potential offset rehabilitation linkages between the Bimblebox Nature Refuge and a currently unconnected large area of remnant vegetation located to the northwest and west (**Figure 5**).

This area consists mostly of Eucalypt open woodland and to a lesser extent of Acacia woodlands on sandstone ranges (**Section 5.3.1**). Additionally this area is currently link to Cudmore National Park that occurring approximately 55 km north of the study area.

These offsets would have the potential to enhance the existing connectivity between the Bimblebox Nature Refuge and the areas to the northwest and west as well as providing a contiguous link to Cudmore National Park.

Barrier Effects

Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of fragmented habitat. This could result in either a complete halt to movement or a reduced level of movement between fragments. Species most vulnerable to barrier effects smaller ground-dwelling species and species with low mobility. Species least vulnerable to barrier effects tend to be those that are highly mobile (e.g. birds and bats), although even these species can vary in their response to barriers.

The mine area could potentially form a barrier for fauna movements to the north of the Bimblebox Nature Refuge, but since most of this area is already degraded habitat (dominated by Buffel Grass), it is unlikely that impacts will be significant. The primary north-south fauna corridor in the study area is that provided by the riverine environments of Lagoon Creek, which is currently fragmented through partial clearing. Construction of the mine will require diversion of Lagoon Creek and further reduce the connectivity at this location.

Edge effects

Edge effects refer to disturbance associated with an edge or boundary between retained vegetated habitats and cleared areas such as mining areas or infrastructure. While the existing vegetated habitats are already affected by edge effects resulting from previous clearing, grazing and roads, new edges would be created during the construction phase of the Project. Edge effects may potentially reduced soil moisture, increased wind, dust, noise and light impacts. Such changes have the potential to alter species composition and abundance in the vicinity of the mine, increase predation and competition, and particularly increase weed invasion. This is most likely to occur along the margin between the remaining Bimblebox Nature Refuge and the mine and along the remaining Lagoon Creek riverine environments and the mine.

6.8 Potential Impacts on Threatened and Near Threarened Fauna Species

No Threatened or Near Threatened species under the NC Act were observed during the field survey. Six species were, however, identified as potentially occurring within the vicinity of the mine surface clearance footprint based on the occurrence of their preferred habitat (**Table 6**). The degree of impact on these species is shown in **Table 10**.

For the purposes of this study, these species are considered to be present in the area and are thus treated accordingly and included in the development of the mitgation measures presented in **Section 8.**

Table 10. Potential Impacts and Significance of Impacts on Threatened and Near Threatened Fauna Species

Species	Status		Preferred habitat	Ocurrence of preferred habitat within mine surface clearance footprint	Potential Impacts	Significance of Impacts
	NC	EPBC				
Yakka Skink (*Egernia rugosa*)	V	V	Poplar box, ironbark, Brigalow, white cypress pine, mulga, bendee and lancewood woodlands, open forests. Substrates include rock, sand, clay and loamy red earth. Dense ground cover, rocky outcrops, hollow logs and animal burrows are considered to provide suitable microhabitat for this species (Cogger 2000, Cogger *et al.*1993, Richardson 2006).	All treed areas, although preference for dense ground cover	Unlikely as dense ground cover generally absent from footprint area and minor consequence from loss of marginal habitat.	L = 2 C = 2 Low (4)
Black-chinned Honeyeater *(Melithreptus gularis)*	NT	-	Grassy woodland dominated by eucalypts, paperbarks or acacias, where there is access to seeding grasses and water (Zann 1976).	All treed areas	Possible occurrence. Moderate consequence if breeding, minor consequence if not breeding. Highly mobile species able to use adjacent habitats.	L = 3 C = 3 Medium (6)
Squatter Pigeon *(Geophaps scripta scripta)*	V	V	Patchy distribution in dry eucalypt forest, often near water. Locally extinct in former southerly parts of its range.	All treed areas	Likely to result in removal of suitable habitat but negligible consequence as highly mobile species tolerant of disturbance and able to use a wide range of habitats.	L = 4 C = 1 Medium (5)
Black-throated Finch (*Poephila cincta cincta*)	E	E	*Eucalypt* woodland and riverside vegetation, including paperbark and wattle shrubland.	All treed areas	Possible occurrence. Moderate consequence if breeding, minor consequence if not breeding. Highly mobile species able to use adjacent habitats.	L = 4 C = 3 Medium (7)

Species	Status		Preferred habitat	Ocurrence of preferred habitat within mine surface clearance footprint	Potential Impacts	Significance of Impacts
	NC	EPBC				
Australian Painted Snipe *(Rostratula australis)*	V	V	Occurs over much of eastern Australia where it favours freshwater swamps and samphire salt marshes (Morcombe 2000).	Riverine habitat	Possible visitor but negligible consequence as unlikely to roost within the study area due to ephemeral nature of watercourses.	L = 3 C = 1 Low (4)

* Taxonomic debate about whether this is a separate species to the widespread and common Sheathtail-bat (*Taphozous georgianus*). Tentative identification only.

6.9 Potential Impacts on EPBC Act Listed Migratory Species

These are all highly mobile species which may visit the study area periodically. However, the footprint and adjoining areas do not include significant or locally uncommon habitat values and these species are unlikely (L = 2) to utilise the site for breeding purposes. As such, the impacts from the construction of the mine on all of these species have negligible (C = 1) consequence and have been determined to be Low (3). Nonetheless, mitigation measures to help minimise these impacts are provided in **Section 8**.

6.10 Potential Impacts on Regionally Significant Fauna Species

Regionally Significant fauna, including the 11 species recorded on the site, will be affected by the direct loss of habitat and other potential indirect impacts described in **Section 6.7**. The direct habitat loss and some edge effect impacts are unavoidable (L = 5). The consequences of these impacts will be minor (C = 2) for most of these species which are generally either mobile (Bush Stone-curlew, Grey-crowned Babbler, Brown Treecreeper), able to utilise adjoining habitats (e.g. Great Brown Broodfrog, Australian Bustard, Rufus Bettong, Hooded Robin) and / or relatively tolerant of disturbance (Common Brushtail Possum, Swamp Wallaby and Spectacled Hare-wallaby). As such the impacts on these species have been determined to be Medium (6). However, for the Desert Mouse, the consequence is potentially moderate (C = 3) as this species is known to be dependent on perennial native groundcovers (Kutt *et al*. 2004) which are well represented in the footprint area and generally less abundant in surrounding areas. Desert Mouse is known to be sensitive to grazing and fire (Kutt *et al*. 2004; Kutt and Woinarski 2007). As such the impact on this species is classified as being potentially High (8).

Mitigation measures, including the potential offset rehabilitation linkages described in **Section 8**, may reduce the likelihood of these impacts by providing alternative suitable habitat areas and potentially reduce the impact on the Desert Mouse. The potential offset rehabilitation linkages would also reduce the likelihood of impacts on other regionally significant fauna species.

6.11 Potential Impacts Associated with Pest Fauna Species

Four species of introduced animals were recorded in the study area (**Section 5.3.4**). Amongst these were two declared pest species listed under the LP Act (i.e. Cat and Rabbit). These pest species are all listed under Class 2, which are pests that are established in Queensland and have, or could have, a substantial adverse economic, environmental or social impact. Management of these pests requires coordination and they are subject to programs led by local government, community or landowners. Under the LP Act Landowners must take reasonable steps to keep land free of Class 2 pests.

It is possible (L = 3) that the operation of the mine will attract pest fauna species due to factors such as the introduction of permanent water sources increased food availability and human and vehicular movement… As such, the consequence on adjoining remnant vegetation areas could potentially be moderate (C = 3). The potential impacts associated with enhancing the environment for pest fauna species is Medium (6).

6.12 Potential Impacts to Wetlands

The mine will require diversion of the Lagoon Creek and some of its tributaries. These are identified by the DERM Queensland Wetland Mapping as watercourses that are fringed with RE 10.3.14 and RE 10.3.15. Lagoon Creek contains a number of small temporary / semi-permanent waterholes which are fringed by mature red gums. The mine will require clearing and removal of these wetlands. The potential impacts on the aquatic values associated with these wetlands are detailed in a separate technical report for the EIS.

6.13 Summary of Impacts Assessment During Construction

Table 11 summarises the impacts of construction activities on the terrestrial ecology of the area. It also provides an assessment of the risks before and after mitigation measures.

Table 11. Risk Ratings for Construction Phase Impacts Before and After Mitigations

Activity	Impact	Risk Assessment (L, C) Score	Mitigation Measures	Residual Risk After Mitigation Measures Implemented
Clearing of vegetation	**Loss of habitat and resources** Approx. 4,595 ha of native vegetation will be cleared.	Unavoidable (5) Minor (2) Medium (6)	• Infrastructure should be located away from remnant vegetation areas whenever possible • Ensure only mine footprint is cleared • Offset vegetation clearing	Unavoidable (5) Minor (2) Medium (6)
	Loss of Near Threatened species Approx. 21-31 Large-podded Tick-trefoil (over half of the known plants within the study area) will be cleared.	Unavoidable (5) Major (4) High (9)	• Develop Significant Species Management Plan • Offset commitments relating to the species	Unavoidable (5) Moderate (3) High (8)
	Loss of Environmentally Sensitive Area Approx. 3,926 ha (52%) of Bimblebox Nature Refuge will be cleared.	Unavoidable (5) Major (4) High (9)	• Offset vegetation clearing	Unavoidable (5) Major (4) High (9)
	Direct mortality of wildlife Low mobility, nocturnal, tree hollows-dependant and / or burrowing species have the potential to be injured or died during clearing activities.	Possible (3) Moderate (3) Medium (6	• Employ a fauna handler to check all vegetation prior to clearing • Develop Significant Species Management Plan • Enforce construction-zone speed limits • Educate personnel about environmental responsibilities	Possible (3) Minor (2) Medium (5)

	Restricted fauna movement Clearing of vegetation will result in increased barrier effect, edge effect and loss of connectivity, in particular for species with low mobility.	Possible (3) Minor (2) Medium (5)	• Offset vegetation clearing	Possible (3) Minor (2) Medium (5)
Introduced pests and weeds	Weeds and feral pests are typically associated with increased human activity. The mine activities could spread environmental weeds in the adjoining woodlands and riparian areas and could also favour pest species.	Possible (3) Moderate (3) Medium (6)	• Develop a Weed and Pest Management Plan • Wash down vehicle • Control movement of machineries and trucks onsite	Unlikely (2) Minor (2) Low (4)
Increase in light, noise and dust	The mine activities will cause a localised increase in noise, light and dust. This has the potential to disrupt local wildlife behaviour.	Likely (4) Minor (2) Medium (6)	• Monitor dust emission regularly • Fit lights with guards to allow for directional lighting • Maintain all construction machinery to limit noise level	Likely (4) Negligible (1) Medium (5)

7.0 Potential Impacts During Operation

Mine operations include on-going underground excavations (both vertically and horizontally), resource extraction, loading, site maintenance and rehabilitation of disturbed areas. Without appropriate mitigation measures, potential impacts of these operational activities can include generation of dust, noise and light, introduction of weed species, changed fire regime through accidental fires, wildlife mortality through collisions with vehicles, accidental release of pollutants and inadvertent clearing for temporary facilities or lay down areas storage. The following section discusses these potential impacts on particular environmental elements and identifies the likelihood of occurrence and the potential consequence of these impacts.

7.1 Significance of Operation of the Mine in a State, Bioregional and Local Context

It is not anticipated that the operation of the mine will result in any State significant impacts.

The operation of the mine has the potential to result in both regional and localised impacts. The following section discusses the potential impacts that may be caused by the mine operation including potential impacts upon regionally significant fauna species.

The proposed clearing of 4,595 ha of LCRE represents approximately 7% of that which occurs within the 10 km buffer and approximately 0.3% of that occurring in the bioregion. Within the Desert Uplands bioregional context, the mine has the potential to have a Medium impact upon the Bimblebox Nature Refuge and its flora and fauna through indirect impacts associated with the operation of the mine. However it is considered that with adequate implementation of management plans these impacts can be largely avoided **(Section 8)**. There is also potential that the Bimblebox Nature Refuge may benefit, to varying degrees, from the proposed offset rehabilitation linkages.

7.2 Potential Impacts of Mine Operation on Flora in General

The main potential impacts to flora associated with the operation of the mine are:

- Potential for dust to reduce the health of retained vegetation in the vicinity of the clearance footprint;
- Potential for accidental fires to alter the biodiversity of the adjoining areas;
- Potential for temporary facilities, materials and equipment to damage areas outsid e the construction footprint;
- Potential to alter the surface and near surface water characteristics for areas adjoining and downstream of the mine (noting that watercourse diversions will be developed to help ensure that significant alterations to surface and near surface water levels are avoided); and,
- Potential for accidental and inappropriate release of pollutants which could contaminate local soils and waterways, reducing the health of riparian and other flora.

The potential to alter surface and near surface water characteristics will be managed through the establishment of appropriate watercourse diversions and appropriate management of mine wastes and other potential pollutants. All of the above listed potential impacts are unlikely (L = 2) to eventuate, assuming that widely accepted standards of environmental practise are implemented. Their consequences could potentially be moderate (C = 3) so the impacts

associated with these indirect impacts have been determined to be Medium (5). Mitigation measures to help minimise these impacts are provided in **Section 8**.

7.3 Potential Impacts of Mine Operation on Threatened and Near Threatened Ecological Communities

There are no vegetation communities within the study area that are listed under the EPBC Act. As such, no impacts are expected to EPBC Threatened Ecological Communities or VM Act Endangered or Of Concern REs from the operation of the mine.

The potential impacts on Least Concern REs associated with the operation of the mine are as for flora in general (**Section 7.2** above).

7.4 Potential Impacts of Mine Operation on Threatened and Near Threatened Flora Species

Five populations of Large-podded Tick-trefoil are known to occur within the vicinity of the mine surface clearance footprint and potential habitat occurs immediately adjacent to this area.

Potential impacts associated with operation of the mine on this species include:

- Potential impacts on the health and viability of plants outside the clearance footprint through:
    - Potential for dust to reduce the health of plants and associated vegetation retained outside the construction footprint;
    - Potential for temporary facilities, materials and equipment to damage plants and associated vegetation outside the construction footprint; and
    - Potential for accidental and inappropriate release of pollutants.

These impacts are unlikely (L = 2), assuming widely accepted standards of environmental practise. Their consequences could potentially be major (C = 4) so the impacts associated with these indirect impacts have been determined to be Medium (6). Mitigation measures to help minimise these impacts are provided in **Section 8**.

No significant impacts are anticipated from the operation of the mine for any Threatened or Near Threatened flora species with the exception of Large-podded Tick-trefoil.

7.5 Potential Impacts of Mine Operation on Environmentally Sensitive Areas

The potential impacts on the Bimblebox Nature Refuge associated with the operation of the mine include:

- Increased edge effects (through potential increase in the amount of dust, noise and light entering the woodland);
- Potential for dust to reduce the health of retained vegetation in the vicinity of the clearance footprint;
- Potential for noise and light (at night) to reduce the value of the Refuge for some fauna species (no particularly sensitive fauna species have been identified and this is likely to be a negligible to minor impact); and

- Potential for temporary facilities, materials and equipment to damage areas outside the construction footprint.

Assuming widely accepted standards of environmental practise, these indirect impacts are unlikely (L = 2) to occur. Their consequences could potentially be moderate (C = 3) so the impacts associated with these indirect impacts have been determined to be Medium (5). Mitigation measures to help minimise these impacts are provided in **Section 8**.

The potential offsets would have the potential to compensate for some of the local terrestrial flora and fauna impacts on the Bimblebox Nature Refuge.

7.6 Potential Impacts of Mine Operation on Associated with Declared and Other Weeds

The operation of the mine has the potential to spread existing declared, environmental and other weeds and introduce new weed species to the area through earthworks, movement of vehicles, machinery, equipment, materials and fill.

These impacts are unlikely (L = 2), assuming widely accepted standards of environmental practise are implemented. Their consequences for terrestrial ecology could potentially be moderate (C = 3) so the impacts associated with these indirect impacts have been determined to be Medium (5). Recommendations aimed at controlling the introduction and spread of weed species are provided in **Section 8**.

7.7 Potential Impacts of Mine Operation on Fauna in General

Potential impacts on fauna are likely to include the following:

- Potential reduction in habitat values and general health and viability through edge effects such as potential increase in dust, noise and light pollution and changed moisture availability;

- Mortality through potential collisions with vehicles; and

- Barrier effects (associated with the open cut mine).

These impacts are possible (L = 3) and could potentially be of moderate (C = 3) consequence for some species. As such, they have been determined to be Medium (6). These potential offsets would have the potential to enhance the existing connectivity between the Bimblebox Nature Refuge and the Cavendish area and the areas to the northwest and west. Other mitigation measures to help minimise these impacts are provided in **Section 8.**

7.8 Potential Impacts of Mine Operation on Threatened and Near Threatened Fauna Species

The potential impacts for these species associated with the operation of the mine are as described for fauna in general in **Section 7.7**. The operation of the mine is unlikely (L = 2) to be of more than minor (C = 2) consequence for any Threatened or Near Threatened fauna species and the impacts are therefore identified as Low. Nonetheless, mitigation measures to further reduce the potential for any such impacts are presented in **Section 8.**

7.9 Potential Impacts of Mine Operation on EPBC Act Listed Migratory Species

The potential impacts for these species associated with the operation of the mine are as described for fauna in general in **Section 7.7**. These are all highly mobile species which may

visit the study area periodically. However, the mine clearance footprint and adjoining areas does not include significant or locally uncommon habitat values and these species are unlikely to utilise the site for breeding purposes. As such, the operation of the mine is unlikely (L = 2) to be of more than minor (C = 2) consequence for any of these species and the impacts are therefore identified as Low (4). Nonetheless, mitigation measures to help minimise these impacts are provided in **Section 8**.

7.10 Potential Impacts of Mine Operation on Regionally Significant Fauna Species

The potential impacts for Regionally Significant species, with the exception of the Desert Mouse, are as described for fauna in general in **Section 7.7** and are unlikely (L = 2) to be of more than minor (C = 2) consequence for any of these species. As such, the impacts have been determined to be Low (4).

For the Desert Mouse, the operation of the mine could possibly (L = 3) cause a reduction in habitat values in the areas adjacent to the mine footprint through edge effects such as potential increase in dust, noise and light pollution. The consequence could potentially be moderate (C = 3) and therefore the impact has been determined to be potentially Medium (6).

Mitigation measures, including the potential offset rehabilitation linkages described in **Section 8**, may provide a positive benefit for the Desert Mouse to Medium.

7.11 Potential Impacts of Mine Operation Associated with Pest Fauna Species

It is possible (L = 3) that the operation of the mine will favour pest fauna species and the consequence on adjoining remnant vegetation areas could potentially be moderate (C = 3). As such the potential impacts associated with enhancing the environment for pest fauna species is Medium (6).

7.12 Summary of Impacts Assessment During Operation

Table 12 summarises the impacts of operation activities on the terrestrial ecology of the area. It also provides an assessment of the risks before and after mitigation measures.

Table 12. Risk Ratings for Operation Phase Impacts Before and After Mitigations

Impact	Risk Assessment (L, C) Score	Mitigation Measures	Residual Risk After Mitigation Measures Implemented
Increase in light, noise and dust The mine activities will cause a localised increase in noise, light and dust. This has the potential to reduce the health of retained vegetation (including Large-podded Tick-trefoil) and disrupt local wildlife behaviour.	Unlikely (2) Moderate (3) Medium (5)	• Monitor dust emission regularly • Fit lights with guards to allow for directional lighting • Maintain all construction machinery to limit noise level • Implement Significant Species Management Plan	Unlikely (2) Minor (2) Low (4)
Accidental or inappropriate release of pollutants Potential for accidental and inappropriate release of pollutants which could contaminate local soils and waterways, reducing the health of riparian and other flora.	Unlikely (2) Moderate (3) Medium (5)	• Install Gross Pollutant Traps, detention tanks and filters to capture oil / hydrocarbons, fines and heavy metals • Regular machinery and vehicle maintenance	Unlikely (2) Minor (2) Low (4)
Potential to alter the hydrological characteristics for adjoining and downstream areas	Possible (3) Severe (5) High (8)	• Monitor adjoining wetland areas for water quality and hydrology impacts	Possible (3) Moderate (3) Medium (6)

Animal death and / or injury due to collision with vehicles	Possible (3) Moderate (3) Medium (6)	• Enforce construction-zone speed limits • Educate personnel about environmental responsibilities	Possible (3) Minor (2) Medium (5)
Weeds and feral pests are typically associated with increased human activity The mine activities could spread environmental weeds in the adjoining woodlands and riparian areas and could also favour pest species.	Unlikely (2) Moderate (3) Medium (5)	• Develop a Weed and Pest Management Plan • Wash down vehicle • Control movement of machineries and trucks onsite	Unlikely (2) Minor (2) Low (4)

8.0 Mitigation and Management

8.1 Mitigation and Management Recommendations for Flora

The following measures should be implemented during the construction phase to mitigate impacts on flora within and adjacent to the project area.

Construction

- Infrastructure should be located away from remnant vegetation areas whenever possible;
- All vegetation clearing boundaries should be clearly identified in the field;
- An offset strategy which compensates for all unavoidable clearing should be developed and implemented (refer to **Section 8.3**);
- Fire fuel loads should be monitored and vehicle activities should be restricted to roads, access tracks and hardened surfaces to reduce the possibility of wildfire. Vehicles should be fitted with spark arrestors and fire fighting equipment should be available at construction sites;
- A Fire Management Plan should be developed and implemented in order to provide for the protection of infrastructure;
- A detailed Weed Management Plan that addresses the construction, rehabilitation and operation phases of the project should be prepared prior to construction. This Plan should include hygiene protocols to minimise the likelihood of introduction and spread of environmental, agricultural and declared weeds, including:
    - The implementation of sediment control mechanisms to reduce the potential for the spread of weed species into sensitive areas;
    - Vehicle wash down procedures; and
    - Monitoring and weed inspections (monitoring across disturbed areas on a monthly basis is recommended during construction);
- All construction personnel will be educated through inductions to ensure compliance with environmental requriements;
- Watercourse diversion activities will be undertaken during the dry season and utilise best practice methods to minimise risk of impact upon terrestrial and aquatic flora and fauna associated with these watercourses;
- Detailed Sediment and Erosion Management Plans should be developed prior to construction to minimise sediment runoff. The plan should include a requirement to rehabilitate disturbed areas as soon as possible after disturbance;
- Dust monitoring should be undertaken and dust reduction measures should be implemented where necessary. These measures could include:
    - The regular maintenance and wetting down of tracks to minimize dust generation;

  - The implementation and enforcement of a site speed limit to minimise dust generation; and
  - Cleared areas to be rehabilitated as soon as practicable.

- A detailed Mine Rehabilitation and Closure Pan should be developed that includes the identification of the intended final landforms and landuse. The mine rehabilitation and closure plan should include a detailed rehabilitation monitoring and evaluation plan including monitoring schedule (e.g. quarterly monitoring of areas under rehabilitation). Depending on the final landuse objectives suitable completion criteria and indicators to measure the progress of rehabilitation may include 70% of cover of native and introduced species within each stratum as occurring on adjoining reference sites of the same landuse type. At least two reference sites within the same sub-catchment should be established within each landuse (possibly including each RE depending on final landuse objectives) to provide benchmarking of rehabilitation progress and completion; and

- A Significant Species Management Plan should be developed for Large-podded Tick-trefoil in accordance with DERM requirements. This plan should include:
  - proposed management measures including those identified for construction and operation of the mine;
  - a monitoring and evaluation program for the species; and
  - offset commitments relating to the species.

Operation

- The Weed Management Plan should be implemented and the regular monitoring of the prevalence of weed species in disturbed and adjacent areas should be undertaken;
- Fire fuel loads should be monitored and vehicle activities should be restricted to roads, access tracks and hardened surfaces to reduce the possibility of wildfire. Vehicles should be fitted with spark arrestors and fire fighting equipment should be available at construction sites;
- All personnel will be educated through inductions to ensure compliance with environmental requirements;
- Remnant vegetation areas adjacent to the mine footprint should be monitored using the Queensland Government Biocondition Assessment methodology with the purpose of identifying the presence of edge effect impacts from the mine (e.g. dust, weeds) on these areas;
- The Rehabilitation and Mine Closure Plan should be implemented including the identified rehabilitation monitoring and evaluation program;
- Gross Pollutant Traps, detention tanks and filters may also be installed to capture oil / hydrocarbons, fines and heavy metals to avoid the potential release of harmful pollutants;
- Monitor adjoining wetland areas for water quality and hydrology impacts to ensure baseline conditions are maintained;

- All future infrastrucutre should, wherever practicable, be located within previously cleared areas; and

- The Significant Species Management Plan for Large-podded Tick-trefoil, including the monitoring and evaluation program should be implemented.

8.2 Mitigation and Rehabilitation Recommendations for Fauna

Fauna mitigation and rehabilitation recommendations include those identified above for flora. Additional recommendations specifically for fauna are provided below.

Construction

- Construction areas that pose a risk to fauna should be fenced off where practicable;

- Fauna handlers should be present to survey for, and if necessary relocate wildlife immediately prior to and during clearing activities;

- Field survey should be undertaken to confirm absence / detect presence of Black-throated Finch and Star Finch immediately prior to construction activities;

- Remove vegetation in a staggered sequence to allow fauna species to relocate off site;

- If surface water is required, relevant permits should be obtained, and consideration should be given to water retention for use by local fauna;

- Appropriate strategies should be developed and implemented to minimise the risk of road kill including (reduced speed zones, minimise vehicle movement during times of high fauna activity, for example dawn, dusk and at night);

- Lighting should be limited to construction areas and lights in close proximity to adjoining woodlands and riparian areas should be fitted with guards to allow for directional lighting away from these areas of remnant vegetation;

- All construction machinery should be well maintained to ensure it is operating at the lowest possible noise level;

- The Mine Rehabilitation and Closure Plan should include final landuse objectives for fauna and suitable completion criteria and indicators to measure the progress of rehabilitation. This may include 70% of habitat features on adjoining reference sites of the same landuse / fauna habitat types. At least two reference sites within the same sub-catchment should be established within each landuse / habitat type (possibly including each RE depending on final landuse objectives) to provide benchmarking of rehabilitation progress and completion from a fauna habitat perspective; and

- A Significant Species Management Plan should be developed for Desert Mouse in accordance with DERM requirements. This plan should include:

    - proposed management measures including those identified for construction and operation of the mine;

    - a monitoring and evaluation program for the species; and

    - offset commitments relating to the species.

Operation

- Do not allow domestic animals on-site;
- Implementation of the Mine Rehabilitation and Closure Plan which includes the specified landuse / fauna habitat objectives and progress and completion criteria;
- Gross Pollutant Traps, detention tanks and filters may also be installed to capture oil / hydrocarbons, fines and heavy metals to avoid the potential release of harmful pollutants;
- Monitor adjoining wetland areas for water quality and hydrology impacts; and
- The Significant Species Management Plan for Desert Mouse, including the monitoring and evaluation program should be implemented.

8.3 Environmental Offsets

Subject to landholder approval, Waratah Coal is willing to establish potential offset rehabilitation linkages between the Bimblebox Nature Refuge and currently unconnected remnant vegetation areas to the northwest and partially connected remnant vegetation to the west (**Figure 5**).

These potential offsets would aim to compensate for some of the unavoidable impacts to flora and fauna associated with the clearing of the mine footprint. The reconnection to the remnant vegetation within the areas to the northwest would overcome the current fragmentation that exists for many fauna species between these two remnant vegetation areas due to the extensive area of Buffel Grass pasture. Species such as the Desert Mouse would be likely to benefit from this potential reconnection.

The connection to the open eucalypt and lancewood woodlands upon the sandstone escarpment northwest would provide the benefit of forming a linkage across the topographical elements of the landscape. The linkage would greatly enhance connectivity between Lagoon Creek and the open eucalypt woodlands of the Bimblebox Nature Refuge to the woodlands on the slopes and the crest of the sandstone escarpment. The woodlands of the sandstone escarpment are part of a large north-south remnant vegetation belt which extend for approximately 70 km to the north and include Cudmore National Park. Improved connectivity of the Bimblebox Nature Refuge to this large vegetation belt would have a positive effect on the biodiversity of the Refuge and wider landscape.

Once landholder views on the potential for offset rehabilitation linkages to be established in these areas is ascertained, these linkages could be included in a detailed environmental offsets strategy which should be developed prior to the commencement of the project. That offset strategy should identify the environmental offset activities which will be established to compensate for unavoidable ecological impacts (including among other things, loss of vegetation, removal of Large-podded Tick-trefoil and Desert Mouse habitat).

To the greatest practicable extent the offset activities will address both Commonwealth and Queensland Governments' offsets legislation and policy, including Part 9 of the EPBC Act and the Queensland Government's Environmental Offsets Policy (QGEOP) (EPA 2008). The offset activities should incorporate the following principles:

- Offsets should only be utilised in situations where impacts on environmental values are unavoidable;
- The offset must directly relate to the environmental value that will be impacted, often referred to as the "like for like" principle;

- The offset may be either direct or indirect actions. A direct action usually requires the on-ground maintenance and / or improvement of the protected matter. An indirect action, however, includes a wide range of actions that improve the knowledge and understanding of a protected matter in order to facilitate its conservation;

- The implementation of the offset must be timed to minimise the time lag between the impact and the delivery of the offset;

- Where possible the offset will be located in the vicinity of the impact;

- The offset must be legally secured; and

- Mechanisms will be put in place to ensure that the offset is enforceable, monitored and audited.

According to the QGEOP, an environmental offset is taken to be legally secured if protected by some form of legally binding mechanism. These can include:

- Designation as a protected area under the NC Act;

- Designation as an area of high nature conservation value under the VM Act, and

- The purchase of land or the establishment of a covenant under the *Land Title Act 1994* (EPA 2008).

It is preferable that offsets are protected for the long term by purchasing land or establishing covenants on title (e.g. VM Act covenants). As such, selection of offset sites will also depend on a number of non-environmental factors including:

- Land tenure – tenure needs to enable purchase or covenants on title;

- Landholder preferences – it will be necessary to find willing landholders to sell or covenant land; and

- Land use – (e.g. possible synergies and constraints relating to mining tenements and other land uses).

It is recommended that the China First Project Offset Strategy set out a process to identify landholders within offset priority areas. In the first instance, sites should be identified on the basis of their conservation values and similarity to those areas to be impacted (“like for like”).

9.0 Conclusion

9.1 Assessment Outcomes

The majority of the mine will be underground and is unlikely to impact on terrestrial flora and fauna. The open cut and clearance footprint of the mine will be approximately 14,600 ha, of which 69% is located upon Buffel Grass pasture of low terrestrial ecological value.

No EPBC Act listed Threatened Communities or VM Act Endangered or Of Concern communities will be impacted by the mine.

The footprint requires unavoidable clearing of approximately 4,595 ha of Least Concern remnant vegetation. This clearing will have High impacts upon:

- RE 10.3.27, listed as Of Concern under the DERM Biodiversity Status;
- RE 10.3.12, listed as Least Concern under the VM Act;
- Large-podded Tick-trefoil;
- The Bimblebox Nature Refuge; and
- Desert Mouse.

The clearing will also have a Medium impact upon:

- Riparian / Wetland REs associated with Lagoon Creek and some of its tributaries;
- Two REs listed as Endangered under the DERM Biodiversity Status;
- RE 10.3.4, listed as Of Concern under the DERM Biodiversity Status;
- Black-chinned Honeyeater (if breeding at time of clearing);
- Squatter Pigeon (although this is of negligible consequence for the species);
- Black-throated Finch (if breeding at time of clearing); and
- Regionally Significant and Least Concern fauna in general.

Operation of the mine also has potential to have indirect impacts upon terrestrial flora and fauna including High impacts on Large-podded Tick-trefoil, Bimblebox Nature Refuge and Desert Mouse, although (assuming there is not significant alteration of hydrological characteristics of areas adjoining and downstream of the mine) these would largely be avoidable with the implementation of appropriate mitigation measures.

Waratah Coal proposes to develop an Environmental Offsets Package for the project in accordance with Commonwealth and Queensland offset policies to compensate for unavoidable ecological impacts. Subject to landholder views, this package could potentially include establishment of an offset rehabilitation linkage from the Bimblebox Nature Refuge to currently isolated remnant vegetation on the range to the northwest of the site.

9.2 Recommended Commitments

Construction

- Clearly identify vegetation clearing boundaries with temporary construction fencing prior to the commencement of the work;
- Develop a whole of project offset strategy;

- Monitor fire fuel loads regularly;
- Restrict vehicle activities where posible to roads, access tracks and hardened surfaces;
- Vehicles, where possible, to be fitted with spark arrestors;
- Fire fighting equipment will be available at construction sites;
- Develop and implement a Fire Management Plan prior to construction;
- Prepare a detailed Weed Management Plan prior to construction;
- Develop detailed Soil and Erosion Management Plan prior to construction;
- Monitor dust on a daily basis;
- Develop a detailed Mine Rehabilitation and Closure Plan that includes improvements to biodiviersity values;
- Develop a Significant Species Management Plan for Large-podded Tick-trefoil;
- Obtain a permit to disturb Large-podded Tick-trefoil prior to construction;
- Fence off all construction areas that pose a risk to fauna;
- Provide for fauna handlers immediately prior to and during all clearing activities;
- Undertake field survey to confirm absence / detect presence of Black-throated Finch and Star Finch immediately prior to construction activities;
- Remove vegetation in a staggered sequence to allow fauna species to relocate off site;
- Monitor road kills;
- Limit lighting for construction areas;
- Maintain all construction machinery to ensure it is operating at the lowest possible noise level;
- Develop a Significant Species Management Plan for Desert Mouse.

Operation

- Monitor the prevalence of weed species on all disturbed areas regularly;
- Monitor fire fuel loads regularly;
- Restrict vehicle activities to roads, access tracks and hardened surfaces;
- Monitor remnant vegetation areas adjacent to the mine footprint;
- Implement the rehabilitation and mine closure plan;
- Monitor Large-podded Tick-trefoil in the vicinity of the mine footprint in accordance with the Significant Species Management Plan; and
- Monitor the Desert Mouse in the vicinity of the mine footprint in accordance with the Significant Species Management Plan.

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Appendix 1 – Assessment of EPBC Matters of National Environmental Significance Occurring in the Study Area (Mine) Against Significant Impact Criteria

Introduction

Matters of National Environmental Significance (MNES) are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act relates to projects that involve or impact upon MNES and addresses Australia's commitments to international environmental law and treaties.

Desktop and field studies were used to identify, describe and assess key flora and fauna values of the study area and potential impacts associated with both the construction and operation of the mine.

Description of the Proposed Action

Waratah Coal is proposing to develop a new coal terminal on land incorporating the Port of Abbot Point and the Abbot Point State Development Area (APSDA), a new mine near Alpha in central Queensland and a new heavy haul standard gauge rail system linking the mine and coal terminal. The project is called the China First Project.

The mine development includes the underground and open cut mines, coal preparation plants and the supporting coal handling infrastructure through to the train loading facility. The rail component commences at the balloon loop at the mine and ends at the balloon loop adjoining the coal terminal at the APSDA, and includes the rail line. The coal terminal commences at the train unloading facility and includes infrastructure through to the ship loaders. The coal terminal includes onshore and offshore components at the APSDA and waters of the Port of Abbot Point respectively.

Description of the Affected Environment

The Project is located within the Desert Uplands bioregion. The bioregion is one of 85 bioregions recognised in Australia and one of 13 located in Queensland. This bioregion encompasses an area of about 70,300 sq. kms and straddles the Great Dividing Range between Blackall and Pentland in central northern Queensland. The bioregion partly lies within the Galilee and Eromanga Basins.

The vegetation of the bioregion consists predominantly of eucalypt and acacia woodlands (often with an open spinifex understorey). The bioregion includes 29 vulnerable and 14 endangered REs that support habitat for 21 threatened species. There are five nationally important wetlands and another 45 wetlands of regional significance present in the bioregion. The Galilee and Buchannan Lakes, in addition to numerous other smaller lakes are the dominant landscape features within the bioregion.

Most of the bioregion is under leasehold tenure and is used for cattle grazing and some sheep grazing in the west (DNRW, 2006). Recent work by McCosker *et al*. (2009) suggests that there is some degree of compatibility between grazing management and biodiversity within this bioregion.

The dominant land use across the proposed mine site is cattle grazing. A significant portion of the site is cleared of standing timber for cattle pastures. These areas are dominated by Buffel Grass (*Pennisetum ciliare*), an introduced invasive pasture species which is well established on rough, blade ploughed terrain on low, undulating hills.

Part of the mine surface clearance footprint occurs in the north and eastern parts of the BNR, an area gazetted under the *Nature Conservation (Protected Areas) Regulation 1994*. The vegetation within this area consists predominantly of Poplar Box (*Eucalyptus populnea*) and Silver-leaved Ironbark (*Eucalyptus melanophloia*) open woodland (REs 10.5.12, 10.5.5). The BNR is identified as containing 'Special biodiversity values' and is of value as a 'Wildlife refugia'. It is mapped as being of Local Significance within the Desert Uplands Biodiversity Planning Assessment (EPA, 2005).

Immediately to the south-west of the BNR the study area encompasses a woodland area with similar vegetation to that of the BNR. Dominant tree species include Silver-leaved Ironbark, Poplar Box and Lancewood (*Acacia shirleyi*). This area is identified as containing Of Concern RE (Biodiversity status), 'Wildlife refugia', 'Disjunct populations', 'Taxa at limit of geographic range', 'Areas of high species richness' and 'Hollow-bearing trees' and is mapped as being of State Significance (EPA, 2005).

Partially cleared sandstone escarpments with some areas supporting Lancewood dominated woodlands are present to the north-west within the study area.

To the east the mine surface clearance footprint transects a riverine habitat comprising several ephemeral watercourses including Lagoon Creek. The vegetation within this area is dominated by Poplar Box open woodland and also contains patches of River Red Gum (*Eucalyptus camaldulensis*) and Brigalow (*Acacia harpophylla*). This area is mapped as being of Regional Significance (EPA, 2005).

Flora Species

There are no vegetation communities within the study area that are listed under the EPBC Act. As such, no impacts are expected to EPBC Threatened Ecological Communities REs from the operation of the mine.

There are no EPBC listed flora species that were found to be occurring within or having ranges that overlap the study area**.** Although it is not possible to rule out the potential occurrence of any EPBC Act listed flora species, the likelihood of occurrence of such species within the mine surface clearance footprint is considered to be low.

Fauna Species

Table 1 presents a list of Threatened, Near Threatened and Migratory fauna species that have been identified as occurring or potentially occurring across the study area. It also presents a description of

preferred habitat for each species and an assessment of whether this habitat occurs within or adjoining the mine surface clearance footprint.

Table 1. Threatened, Near Threatened and Migratory Fauna Species Potentially Present Within the Study Area

Common Name	Scientific Name	EPBC Act	Preferred Habitat	Source	Preferred Habitat present within or adjoining the mine surface clearance footprint
Reptile					
Yakka Skink	*Egernia rugosa*	V	Poplar Box, Ironbark, Brigalow, White Cypress Pine, Mulga, Bendee and Lancewood woodlands, open forests. Substrates include rock, sand, clay and loamy red earth.	1	Yes
Dunmall's Snake	*Furina dunmalli*	V	Brigalow forest and woodland with fallen timber and ground litter, growing on cracking clay soils and clay loam soils.	1	No
Brigalow Scaly-foot	*Paradelma orientalis*	V	Sandstone ridges in woodlands and vine thickets, and in open forests and woodlands, especially ironbark, cypress pine, Brigalow, bull oak, spotted gum and vine scrubs.	1	No. Distributional range is further south.
Bird					
Fork-tailed Swift	*Apus pacificus*	Mi	Summer migrant. Aerial insectivore.	1	Yes
Great Egret	*Ardea alba*	Mi	Widespread species – common.	1	Yes
Cattle Egret	*Ardea ibis*	Mi	Widespread species – common.	1	Yes
Horsfield's Bronze-cuckoo	*Chalcites basalis*	Mi	Found in many wooded habitats (such as open and dry woodland and forest) with a range of understoreys from grasses to shrubs or heath.	6	Yes
Latham's Snipe	*Gallinago hardwickii*	Mi	Marshes and swamps in tall grass.	1	Yes

Common Name	Scientific Name	EPBC Act	Preferred Habitat	Source	Preferred Habitat present within or adjoining the mine surface clearance footprint
Squatter Pigeon (southern)	*Geophaps scripta scripta*	V	Patchy distribution in dry eucalypt forest, often near water. Locally extinct in former southerly parts of its range (southern Queensland / North New South Wales).	1	Yes
White-bellied Sea-eagle	*Haliaeetus leucogaster*	Mi	In association with large, permanent water bodies. Not known to occur within study area.	1	No
White-throated Needletail	*Hirundapus caudacutus*	Mi	Migrant, occasionally found in airspace over study area only.	1	Yes
Rainbow Bee-eater	*Merops ornatus*	Mi	Variety of habitats where it takes insects in flight. May breed in sand banks of creeks and rivers.	1	Yes
Star Finch (eastern)	*Neochmia ruficauda ruficauda*	E	Open grasslands and eucalypt woodlands. Along creeks and streams in reeds and tall grasses. Locally extinct at several sites such as Blackall in central Qld (Higgins *et al.*, 2006; Holmes, 1996) and in the former southern areas of its range (New South Wales).	1	No
Southern Boobook	*Ninox novaeseelandiae*	Mi	Southern Boobooks are seen in a variety of habitats from dense forest to open desert.	6	Yes
Little Curlew	*Numenius minutus*	Mi	Coastal and inland grasslands and black soil plains in northern Australia, near swamps and flooded areas.	1	Yes
Black-throated Finch (southern)	*Poephila cincta cincta*	E	Eucalypt woodland and riverside vegetation, including paperbark and wattle shrubland.	1	Yes

Common Name	Scientific Name	EPBC Act	Preferred Habitat	Source	Preferred Habitat present within or adjoining the mine surface clearance footprint
Australian Painted Snipe	*Rostratula australis*	V	Occurs over much of eastern Australia where it favours freshwater swamps and samphire salt marshes (Morcombe, 2000).	1	Yes
Channel-billed Cuckoo	*Scythrops novaehollandiae*	Mi	Found in tall open forests, usually where host species occur.	6	Yes
Sacred Kingfisher	*Todiramphus sanctus*	Mi	The Sacred Kingfisher inhabits woodlands, mangroves and paperbark forests, tall open eucalypt forest and melaleuca forest.	6	Yes
Mammal					
Northern Quoll	*Dasyurus hallucatus*	E	Prefer rocky areas and eucalypt forests.	1	No

Source: **1** = EPBC Protected Matters Search; **2** = QEPA WildNet record; **3** = Queensland Museum (QM) record; **4** = Bird data online; **5** = WorleyParsons (2009); **6** = Mackay Conservation Council (2009).

EPBC = Listed status under the EPBC Act: **Mi** = Migratory Species.

* Taxonomic debate about whether this is a separate species to the widespread and common Sheathtail-bat (Hall, 2008). Tentative identification only.

Relevant Controlling Provisions

The impacts on fauna and flora have been assessed after reviewing publically available databases, previously published information and studies and detailed field surveys These results indicate that the following terrestrial ecology MNES may be impacted by the Project.

No EPBC MNES were recorded within the study area during the field surveys. However, the review of information available revealed a total of 20 Threatened and Near Threatened fauna species (including 12 species that are not Threatened or Near Threatened but are listed under the EPBC Act as Migratory fauna species) as potentially occurring across the study area.

The habitat assessment identified that the mine surface clearance footprint contains preferred habitat for the following species:

Threatened Species

- Four EPBC listed fauna species:
    - Yakka Skink, *Egernia rugosa* – may occur;
    - Squatter Pigeon, *Geophaps scripta scripta* – may occur;
    - Black-throated Finch, *Poephila cincta cincta* – may occur; and
    - Australian Painted Snipe, *Rostratula australis* – may occur.

Impacts assessment against Significance Criteria for the four EPBC fauna species likely to occur within the study area is shown in **Table 2.**

Migratory Species

- 11 Migratory species protected under the EPBC Act may occur within the study area.

Impacts assessment against Significance Criteria for the eleven EPBC migratory fauna species likely to occur within the study area is shown in **Table 2.**

Assessment of Impact on Matters of National Environmental Significance

Table 2 provides an assessment of the likely significance of the Project's potential environmental effects on MNES. This assessment is based upon the significant impact criteria identified in the EPBC Act Policy Statement 1.1 – "*Significant Impact Guidelines, Matters of National Environmental Significance".*

The EPBC Significant Impact Guidelines provide criteria to consider when undertaking a self-assessment to ascertain whether an action is likely to have a significant impact upon MNES. Firstly, a proponent considers whether there are matters of MNES located within the project area. Secondly, consideration would be given to the proposed action at a broad scale including the potential for indirect impacts. Consideration is given to whether the action is likely to result in a significant impact to the MNES and whether there are adequate mitigation measures in place to avoid or reduce the impacts.

The impact assessments conclude that the proposed mine site is not likely to have a significant impact on threatened species, nor would it interfere with their recovery, assuming suitable mitigation measures are put in place.

Table 2. Significance of Impacts on MNES Fauna

Species name / EPBC Status	Likelihood of Significant Impact	Assessment Against MNES Significance Criteria
Yakka Skink (*Egernia rugosa*) – Vulnerable	Not Likely	An action is likely to have a significant impact on a vulnerable specie if there is a real chance or possibility that it will: • *Lead to a long term decrease in the size of an important population of a species*; This will not occur. No significant population of Yakka Skink is known to occur within the mine footprint area. • *Reduce the area of occupancy of an important population*; This will not occur. No significant population of Yakka Skink is known to occur within the mine footprint area. • *Fragment an existing important population into two or more populations*; This will not occur. No significant population of Yakka Skink is known to occur within the mine footprint area. • *Adversely affect habitat critical to the survival of a species*; This will not occur. The preferred habitat for the species (dense ground cover) is generally absent from the mine footprint area. • *Disrupt the breeding cycle of an important population*; This will not occur. No significant population of Yakka Skink is known to occur within the mine footprint area. • *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the*

Species name / EPBC Status	Likelihood of Significant Impact	Assessment Against MNES Significance Criteria
		extent that the species is likely to decline; This will not occur. The preferred habitat for the species (dense ground cover) is generally absent from the mine footprint area. • *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;* This will not occur. • *Introduce disease that may cause the species to decline; or* This will not occur. • *Interfere substantially with the recovery of the species.* This will not occur.
Squatter Pigeon (*Geophaps scripta scripta*) –Vulnerable	Not likely	An action is likely to have a significant impact on a vulnerable specie if there is a real chance or possibility that it will: • *Lead to a long term decrease in the size of an important population of a species;* This will not occur. No significant population of Squatter Pigeon is known to occur within the mine footprint area. While it is possible that individuals may suffer mortality during vegetation clearing, this is unlikely and at worse would involve only a small numbers of individuals. As such, there will be no significant impact at a population level. • *Reduce the area of occupancy of an important population;* This will not occur. No significant population of Squatter Pigeon occurs within the mine footprint

Species name / EPBC Status	Likelihood of Significant Impact	Assessment Against MNES Significance Criteria
		area. Additionally, the species utilises open grassland areas which are common and widespread in the region. The project footprint is small relative to the area of available habitat. The project will not result in a reduction in the area of occupancy of the local population. • *Fragment an existing important population into two or more populations*; This will not occur. No significant population of Squatter Pigeon is known to occur within the mine footprint area. • *Adversely affect habitat critical to the survival of a species*; This will not occur. • *Disrupt the breeding cycle of an important population*; This will not occur. • *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*; This will not occur. • *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*; This will not occur. • *Introduce disease that may cause the species to decline; or* This will not occur.

Species name / EPBC Status	Likelihood of Significant Impact	Assessment Against MNES Significance Criteria
		• *Interfere substantially with the recovery of the species.* This will not occur.
Black-throated Finch (*Poephila cincta cincta*) – Endangered	Not likely	An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will: • *Lead to a long-term decrease in the size of a population*; This will not occur because pre-clearance survey will be undertaken to confirm the absence / presence of the species. If nesting birds are found to be present clearing activities will be delayed until birds have left the area. • *Reduce the area of occupancy of the species*; The area of occupancy will not be significantly reduced. • *Fragment an existing population into two or more populations*; Fragmentation of existing populations will not occur. • *Adversely affect habitat critical to the survival of a species*; This will not occur. This species if highly mobile and could potentially utilise adjacent habitats. • *Disrupt the breeding cycle of a population*; This will not occur. No population of Black-throated Finch is known to occur within the mine footprint area. • *Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the*

Species name / EPBC Status	Likelihood of Significant Impact	Assessment Against MNES Significance Criteria
		extent that the species is likely to decline; This will not occur. This species if highly mobile and could potentially utilise adjacent habitats. • *Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;* This is unlikely to occur. • *Introduce disease that may cause the species to decline, or* This is unlikely to occur. • *Interfere with the recovery of the species.* This is unlikely to occur.
Australian Painted Snipe (*Rostratula australis*) – Vulnerable		An action is likely to have a significant impact on a vulnerable specie if there is a real chance or possibility that it will: • *Lead to a long term decrease in the size of an important population of a species*; This will not occur. These are all highly mobile species which may visit the study area periodically. However, the mine footprint and adjoining areas do not include significant or locally uncommon habitat values and these species are unlikely to utilise the site for breeding purposes. • *Reduce the area of occupancy of an important population*; This will not occur. No significant population of Australian Painted Snipe is known to occur within

Species name / EPBC Status	Likelihood of Significant Impact	Assessment Against MNES Significance Criteria
		the mine footprint area. • *Fragment an existing important population into two or more populations*; This will not occur. No significant population of Australian Painted Snipe is known to occur within the mine footprint area. • *Adversely affect habitat critical to the survival of a species*; This will not occur. • *Disrupt the breeding cycle of an important population*; This will not occur. No significant population of Australian Painted Snipe is known to occur within the mine footprint area. Additionally, this species is unlikely to roost within the study area due to ephemeral nature of watercourses. • *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*; This will not occur. • *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*; This will not occur. • *Introduce disease that may cause the species to decline; or* This will not occur.

Species name / EPBC Status	Likelihood of Significant Impact	Assessment Against MNES Significance Criteria
		• *Interfere substantially with the recovery of the species.* This will not occur.
Migratory Species	Not Likely	An action is likely to have a significant impact on a vulnerable specie if there is a real chance or possibility that it will: • *Substantially modify (include fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;* This will not occur. These are all highly mobile species which may visit the study area periodically. However, the mine footprint and adjoining areas do not include significant or locally uncommon habitat values and these species are unlikely to utilise the site for breeding purposes. • *Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or* This will not occur. No important habitat for migratory species occur within the mine footprint area. • *Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.* This will not occur. No important populations of migratory species occur in the study area.

Mitigation Measures

The construction and operation of the proposed development has the potential to have a number of direct and indirect impacts on the threatened flora and fauna species and Migratory species occurring within or overlapping the proposed Mine site. These impacts include:

- Direct spatial reduction in remnant vegetation due to clearing;
- Increased edge effects within the Bimblebox Nature Refuge (through reducing the edge to area ratio and moving the edge) including the potential to increase the abundance of Buffel Grass and other weeds;
- Potential for increased fire intensity if Buffel Grass densities within the Bimblebox Nature Refuge are increased;
- Potential for dust to reduce the health of retained vegetation in the vicinity of the clearance footprint;
- Potential for temporary facilities, materials and equipment to damage areas outside the construction footprint;
- Potential to alter the hydrological characteristics for areas adjoining and downstream of the mine; and
- Potential for accidental and inappropriate release of pollutants.

The proposed mitigation measures to minimise the potential impacts of the Project include:

- Develop an offset strategy that compensates for unavoidable clearing, in particular within and linking to the Bimblebox Nature Refuge, in consultation with DERM and DSEWCP;
- Develop a Fire Management Plan, working with Barcaldine Regional Council and the Rural Fire Service;
- Develop Weed and Pest Management Plan in consultation with Barcaldine Regional Council and Biosecurity Queensland;
- Develop a Erosion and Sediment Management Plan incorporating existing State Planning Policy and local management plans;
- Infrastructure will be located away from remnant vegetation areas whenever possible to avoid the potential to inadvertently cause or create additional edge effects;
- All vegetation clearing boundaries will be clearly identified in the field to avoid inadvertent clearing of vegetation;
- Watercourse diversion activities will be undertaken during the dry season and utilise best practice methods to minimise risk of impact upon terrestrial and aquatic flora and fauna associated with these watercourses;
- Detailed Erosion and Sediment Management Plan will be developed prior to construction to minimise sediment runoff. The plan will include a requirement to rehabilitate disturbed areas as soon as possible after disturbance;
- Dust monitoring will be undertaken and dust reduction measures should be implemented where necessary to avoid harm to flora and fauna species. These measures could include:

  - The regular maintenance and wetting down of tracks to minimise dust generation;
  - The implementation and enforcement of a site speed limit to minimise dust generation; and
  - Cleared areas to be rehabilitated as soon as practicable.

- To help minimise impacts on fauna, fauna handlers will be present to survey for, and if necessary relocate wildlife immediately prior to and during clearing activities;
- Field survey will be undertaken to confirm absence / detect presence of Black-throated Finch and Star Finch immediately prior to construction activities. If nesting birds are present, clearing will be rescheduled to avoid disruption;
- Vegetation will be removed in a staggered sequence to allow fauna species to relocate off site;
- Relevant permits will be obtained to allow for surface water channels and drainage patterns to be altered, and consideration will be given to water retention for use by local fauna;
- Appropriate strategies will be developed and implemented to minimise the risk of road kill including (reduced speed zones, minimise vehicle movement during times of high fauna activity, for example dawn, dusk and at night);
- Lighting will be limited to construction areas and lights in close proximity to adjoining woodlands and riparian areas will be fitted with guards to allow for directional lighting away from these areas of remnant vegetation; and
- Domestic animals will not be allowed on-site to reduce the risk to wildlife.

Conclusion

The open cut and clearance footprint of the mine will be approximately 14,600ha, of which 69% is located upon Buffel Grass pasture of low terrestrial ecological value. The majority of the mine will be underground and is unlikely to impact on terrestrial flora and fauna. The impact assessments against the MNES Significant Impact Guidelines 1.1 (2009) found that the proposal is not likely to have a significant impact on:

- Yakka Skink (*Egernia rugosa)*;
- Squatter Pigeon (*Geophaps scripta scripta)*;
- Black-throated Finch (*Poephila cincta cincta)*;
- Australian Painted Snipe *(Rostratula australis)*; and
- Any Migratory species protected under the EPBC Act may occur within the study area.

It is considered that the proposed mitigation measures, including management strategies, are adequate to manage and mitigate the potential impacts on MNES.

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Appendix 2 – Curriculum Vitae

Bruce Thomson

Principal Ecologist

Profile

Bruce Thomson has 30 years of experience in a broad range of environmental assessment, management, concept planning, project proposal and development and conservation disciplines. He is a senior ecologist and biodiversity planner and has worked as a professional botanist, wildlife researcher and conservation manager. Bruce has managed scientific and technical staff (project management) and associated budgets and work programs. He has strong communication skills, having negotiated conservation outcomes in difficult situations with potentially hostile stakeholders; published and presented numerous industry papers, workshops and seminars; and participated in media news and documentary interviews.

Bruce's government and university background has provided experience in fauna consultancy work for the mining industry and he was appointed scientific advisor to the Queensland Government's Flying Fox Consultative Committee. Bruce has conducted field surveys throughout the Northern Territory and has conducted wildlife surveys in southeast Queensland for the Queensland Parks and Wildlife Service.

Qualifications

PhD "Social ecology of the Chocolate Wattled Bat, *Chalinolobus morio*, in southeast Queensland	University of Queensland
Masters of Business Administration (Marketing, Public Sector & Strategic Management) – includes formal qualifications in HRM	University of New England
Bachelor of Applied Science (Natural Resource Management)	University of Canberra

Recent Papers & Publications

Thomson, B.G. (2004) Conservation Management of Cave-dwelling Bats in *Protected Area Management (Principles and Practices)*. Oxford University Press

Thomson, B.G., Reardon, T. and Pavey, C. (2004). *Recovery plan for cave-dwelling bats - Rhinolophus philippinensis, Hipposideros semoni and Taphozous troughtoni* 2000 -2005. Report to Department of the Environment and Heritage, Canberra. Queensland Parks and Wildlife Service, Brisbane

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Career Summary

2008 – Current	Unidel Group Pty Ltd – Principal Ecologist
2003 – 2008	Queensland Parks and Wildlife Service - Senior Conservation Officer (Central Office Secondment) - Bat conservation and policy development
1993 – 2002	Queensland Parks and Wildlife Service - Senior Conservation Officer (Management Planning)
1983 – 1993	Wildlife Research Section, Conservation Commission of the Northern Territory, Alice Springs - Officer in Charge, Northern Territory Southern Regional Herbarium
1981 – 1983	Northern Territory Herbarium, NT Department of Primary Production, Alice Springs - Scientific Research Officer, P2
1979 – 1981	Wildlife Research Section, Territory Parks and Wildlife Commission, Alice Springs - Technical Assistant T2

Areas Of Expertise

- Collection / identification of botanical specimens, nocturnal insects and small mammal bone
- Bat survey using mist nets, bat traps, water trip lines, echo-location call analysis, transect

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Bruce Thomson
Principal Ecologist

material	methodologies and anecdotal observations
• Elliott and large cage trapping and pit fall trapping of small mammals, reptiles and arthropods	• Anecdotal observations of wildlife and active searching techniques
• Extensive involvement with Aboriginal Traditional Owners in fauna survey work in the NT	• Recording of wildlife with automated camera systems (built by Bruce Thomson)

Relevant Experience

Flora	• Botanical surveys, species inventories and biodiversity assessments for projects such as the Yulara development at Ayers Rock • Acquisition planning for national parks such as Kings Canyon NP, Gregory NP on the Victoria River and parts of the Tanami Desert including type specimens for newly recognised species • Monitored and conducted ecological studies on two rare and endangered plant species and described two new species from the northern parts of WA • Curated the NT Herbarium
Fauna	• Conducted fauna trapping surveys for: o Queensland Curtis LNG Project (QGC) o Galilee-Coal Project (Waratah Coal) • Conducted fauna habitat assessments for: o Newstead to Bulla Park Pipeline (APA Group) o Ruby Braemar Pipeline (ERM Power) o Wambo to Goondiwindi Pipeline (ERM Power) o Wallumbilla to Wambo Pipeline (ERM Power) • Involved in the initial capture and captive breeding of the Bilby and Rufous Hare Wallaby (Alice Springs, NT) • Academic supervision of Masters research project on bat roosting ecology • Researched bat behaviour when negotiating steel grills (on mine entrances) • Conducted flying fox taste and smell deterrent chemical trials for fruit crop protection • Research into the social ecology of the Chocolate Wattled Bat (PhD) • Genetic research at Queensland Biosciences Precinct University of Qld, St Lucia
Conservation Management	• Researched and developed concept plans / project proposals for sustainable development of tourism on Queensland Park's estates • Co-authored original concept plan for multi-million dollar, Alice Springs Desert Park • Developed and assisted implement conservation planning strategies in SE Qld • Protected roosting habitat for rare and threatened bat species • Designed and provided advice on the construction of several experimental 'artificial caves' in mining areas • Developed a Species Recovery Plan for three species of Qld endangered bats • Negotiated and implemented ongoing, cooperative research programs
Other Scientific Services – advisory and public relations	• Scientific advisor / founding member - Qld Gvt's Flying Fox Consultative Committee • Advised Melbourne Botanic Gardens, Sydney Botanic Gardens, Mt Isa and numerous local authorities in greater Brisbane • Provided range of botanical services to the NT Government
Communication	• Negotiated conservation outcomes in difficult situations with potentially hostile stakeholders, as in the case of fruit growers and flying foxes and grazing lessees in State Forests

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Bruce Thomson
Principal Ecologist

- Worked closely with Aboriginal groups to conduct surveys
- Presented scientific and conservation papers at international scientific conventions
- Wrote survey reports, ministerial briefing notes and popular publications and provided high level advice to senior government staff and conducted workshops
- Participated in radio and TV interviews for news reports, documentaries and children's programs to promote conservation

Administrative and Financial

- Recruited, managed, supported and trained effective teams and participated in strategic planning and enterprise bargaining processes
- Administered budgets up to $150,000
- Applied for and administered numerous grants ranging from $5,000 to $35,000
- Coordinated regional industrial placement program for University students
- Applied for and implemented EPA license conditions for administrative purposes
- Coordinated and supervised management plans for national parks.

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Wayne Harris
Senior Botanist

Profile

Wayne has more than 20 years experience in biological sciences particularly in plant systematics and plant identification, environmental assessment and vegetation mapping. He has worked in Queensland, Western Australian and Victoria on consultancy assignments for industry and government. Wayne's consultancy work has included route selection, environmental surveying, vegetation mapping, and monitoring.

Wayne has been involved in developing strategies and guidelines for sustainable development and the protection, enhancement and rehabilitation of species and regional ecosystems.

Qualifications

Doctor of Philosophy (Plant Systematic)	University of Queensland
Master of Science	University of Adelaide
Bachelor of Science	University of Adelaide

Affiliations

Research Associate, Queensland Herbarium.

Papers & Publications

Lavarack, P.S., Harris, W.K. & Stocker, G. "*Dendrobium* and its Relatives" 2000. Kangaroo Press. 287p.

Lavarack, P.S. & Harris, W.K. 2002. "Botanica's Pocket Orchids. Random House, Australia.

Awards

Received the Australian Service Medal for service to the community.

Career Summary

2009 – Present	• Unidel Group – Senior Botanist
1998 – Present	• Research Associate at the Queensland Herbarium. • Casual employee at the Queensland Herbarium – plant identification and vegetation assessment, poisons, advise to clients on weeds and other botanical issues. Writing of rare and threatened plant profiles. Member of the committee that developed the Regional Ecosystem framework
Mar – Jun 2009	• Vegetation mapping and condition assessment of waterways for the Murray Darling Freshwater Research Centre
Jan – Jun 2008	• National Project Coordinator for the Weed Spotters Program, run by the CRC for Weed Management.
1998 – Nov 2008	• Consultant for biodiversity assessments of major development projects • Botanical surveys and services for local shire councils and environmental groups (e.g. Desert Channels Queensland, Greening Australia, Pine Rivers Shire Council).
1995	• Granted study leave for three years to pursue a Ph.D. at the University of Queensland in Systemic Botany.

Areas Of Expertise

- Botanical survey
- Vegetation Mapping
- Plant classification and identification
- Orchids

Relevant Experience

Botanical survey	• Queensland Curtis LNG Project (QGC) • Galilee-Coal Project (Waratah Coal)

UNIDEL ENERGY AND INFRASTRUCTURE

Wayne Harris
Senior Botanist

	• Ruby Braemar Pipeline (ERM Power) • Kikori River (Papua New Guinea) catchment biodiversity study, for the World Wildlife Fund for Nature. • 'Missing Link' railway corridor Environmental Impact Assessment for Queensland Rail. • Shoalwater Bay Defence property for Department of Defence. • HMAS Cerberus Defence property for Department of Defence. • Coal slurry pipeline for Tarong Power. • Liquid Niugini Gas. Pipeline route and LNG site selection and botanical surveys.
Scientific biological surveys	• Invited on two occasions to participate on botanical surveys of the Pilbara region, Western Australia for the WA government. • Survey of Mussau Island (PNG) for the National Capital Botanic Gardens, Port Moresby. • Expedition to the Torricelli Mountains, PNG for an orchid survey on behalf of the National Capital Botanic Gardens, Port Moresby.
Other relevant experience - Geological expertise	• In the early part of his career Wayne was employed as a geologist and became Exploration Manager (Eastern Australia) for the Petroleum Division of Western Mining Corporation.

James Gubby
Ecologist

Profile

James Gubby has seven years experience as an ecologist working extensively in weed identification and management as well as flora and fauna surveys in central and southern Queensland. He has extensive field experience in baseline research, remote site ground-truthing and monitoring for major infrastructure, land development, mining, federal, state and local government projects.

James has technical experience in the identification of native, cultivated and pest plant species. He has undertaken vegetation mapping and flora surveys for endemic, threatened and declared plant species.

Prior to joining Unidel, James worked as Pest Management Control Officer for the Livingstone Shire Council and recently completed his Diploma of Conservation and Land Management. James is highly experienced in declared plant identification, monitoring, control and strategic planning. He has also conducted feral animal monitoring programs.

James has provided site supervision and coordination for erosion mitigation and land rehabilitation projects. He has been field officer for contaminated site monitoring, soil, dust and geochemical testing for acid sulphate and contaminant leaching, core drill sampling, aquifer and surface water sampling and hydrogeology monitoring.

James also has extensive experience and well developed knowledge of mapping and GIS systems in Arcview and Mapinfo as well as field data capture.

James has qualifications in agronomy, soil science and conservation land management. His studies have covered riparian restoration and erosion controls, ecosystem ecology, fire planning and management, indigenous and European cultural heritage and environmental legislation.

Qualifications

Diploma of Conservation and Land Management	South West TAFE Warrnambool Victoria
Diploma of Justice	Moreton Institute of TAFE Brisbane
Certificate IV Applied Environmental Management (Natural Resources)	Moreton Institute of TAFE Brisbane

Awards

Chris Dunlea Memorial Award for academic excellence in Environmental Studies – Moreton Institute of TAFE 2002

Nomination for trainee of the Year 2002 Brisbane Region, TAFE Representative and HLA Envirosciences – Queensland Training Awards

Career Summary

2010	Ecologist, Unidel Group
2006 – 2008	Pest Management Control Officer, Livingstone Shire Council (QLD)
2001 - 2006	Senior Environmental Technical Officer/Field Supervisor, HLA Envirosciences Pty Ltd
2001	Industry Placement, QLD Herbarium – EPA Mt Coot-tha

Areas Of Expertise/Specialist Courses

- Course in fauna trapping & monitoring
- Horticulture & plant identification
- Fauna & ecology surveys
- Identification & legislation programs & control & monitoring
- Liaison with government agencies at state & commonwealth level
- Course in marine studies & legislation
- Flora surveys & vegetation mapping
- Water and soil sampling monitoring programs
- Field management & project Logistics
- Land management - erosion & remediation

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James Gubby
Ecologist

Relevant Experience	
Associated Botanical Field Identification	• Threatened Species Management Plan for *Philotheca sporadica* Darling Downs Power Station near Dalby (Energex then Origin) • Proposed corridor assessment. Rare and threatened species identification – Gladstone, Pacific Nickel
Pest Management	• Capricorn Coast National Park Pest Management Plan – Queensland Parks and Wildlife Service • Capricorn Coast Weed Management Strategy Fitzroy Basin Association • Hymenachne Herbicide Research – Central Queensland University • Leuceana Weed Management Strategy for Bruce Highway – Central QLD Dept of Main Roads Livingstone Shire Council & Greening Australia • 1080 Baiting Pest Management strategies Capricorn & Broadwater Regions • Local Government Pest Management Inspections and Identification
Land Development	• Pacific Harbour Golf Course residential development ecological monitoring programs (QM Properties) • Dux Creek Acid Sulphate sampling and monitoring during pre & post development stages, Pacific Harbour Residential Canal Development (QM Properties) • Pacific Harbour Golf Course Hydrogeology well monitoring & aquifer pumping program (QM Properties) • Pacific Harbour Golf Course Agronomy and Pesticide plan (QM Properties) • Bribie Garden Estate Water monitoring program (Burke Constructions) • Bribie Island shopping centre development water monitoring program (Gibway Developments) • Proposed canal development Hydrogeology Assessment & Monitoring Program (Cuposa Developments) • Reef Cove Resort Fauna Assessment & Management Plan for access road realignment (Starline Australia Holdings) • Acid Sulphate & Water monitoring program for Wises Farm Lakes Development Maroochydore for Major Developer • Noosa Forest Court water monitoring program (QM Properties)
Major Infrastructure	• Hornibrook Highway duplication management plan – Benthic Sediment Sampling Dept Main Roads
Mining and Extractive	• Pine Mountain Quarry Acid Lake rehabilitation management plan. Water sampling & parameter recording & modeling – Boral Quarries • Yatala Quarry water monitoring – Boral Quarries • Yeeranderie Goldmine Acid Mine Drainage sampling & remediation – central NSW – Large Mining Operation

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James Gubby
Ecologist

Defence Land Management Rehabilitation	• Sandy Creek rehabilitation project Enoggera Barracks, Dept of Defence • Sandy Creek Erosion Mitigation Plan Enoggera Barracks, Dept of Defence • Amberley RAAF Base & Purga Range Weed Management Stratergy, Dept of Defence • Brisbane Training Areas Greenbank, Enoggera and Widebay Weed Management Strategy • Shoalwater Bay Weed Management Strategy • Shoalwater Bay Weed Management Survey & Feral Species Monitoring • Shoalwater Bay Ecological Estate Impact Assessments • Shoalwater Bay Urban Operations Training Facility – Ecological & Heritage Assessments • Jennings ADI Facility Rehabilitation Plan Contaminated Sites for explosive residue • Shoalwater Bay Flora Impact Assessment for Artillery Firing Range

Renee Coleman

Environmental Consultant

Profile

Renee has extensive environmental management experience, with experience developing and implementing construction Environmental Management Plans. Renee has experience

- Identifying environmental constraints, developing practical mitigation measures and ensuring relevant controls and legal conditions are implemented
- Reviewing and updating Construction Environmental Management Plans and associated documentation
- Performing environmental audits during construction
- Providing emergency environmental response and incident investigation
- Managing the handling and sampling of low level contaminated land and potential acid sulphate soils
- Managing Flora/Fauna aspects of pipeline projects
- Costing, planning and managing vegetation rehabilitation of disturbed areas
- Developing erosion and sediment control plans and implementing control actions
- Managing monitoring programs for noise, dust, vibration, water quality
- Preparing and presenting environmental training/inductions and pre start sessions
- Undertaking community and stakeholder consultation

Qualifications

Bachelor of Science/Arts [2004]	University of the Sunshine Coast

Training Courses

Environmental Management Systems – RABQSA

Management Systems Auditing – RABQSA

Advanced training for Erosion and Sediment Control – International Erosion Control Association

Australian Native Trees, Weed Control, Trees for Rehabilitation – ACS Distance Education

Venomous Snake Relocation course – Educational Reptile Displays

Career Summary

2009 – present	Unidel, Environmental Consultant
2007 – 2009	Mcconnell Dowell Construction, Environmental Manager
2006 – 2007	RLMS, Environmental Specialist
2005	Enertrade Projects Group, Environmental Consultant
2004 – 2005	MBS Environmental, Environmental Consultant

Areas Of Expertise

- Construction Environmental Management
- Environmental Auditing
- Environmental Awareness Training and Inductions
- Erosion and Sediment Control
- Environmental Monitoring
- Vegetation Rehabilitation
- Compliance Monitoring

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Renee Coleman
Environmental Consultant

Relevant Experience	
Environmental Management	• Construction environmental management of the 80km Western, the Purified Recycled Water off take to Wivenhoe and the Coominya Pipeline • Environmental management for the Adelaide Desalination Pipeline ensuring compliance to environmental management conditions and relevant legislation, policies and strategies • Development and implementation of Construction Environmental Management Plan for a pipeline project for Hunter Energy • Development of an ISO14,001 Environmental Management System for Comalco Corporate
Route / Site Selection Studies	• Review of environmental opportunities and constraints for potential power stations sites for Stanwell • Gas pipeline alignment refinement for Hunter Energy • Mulit-purpose pipeline corridor investigation for the Coordinator General • Investigation of potential water pipeline corridor for the Gladstone Area Water Board • Potential gas pipeline corridor investigation for ENERGEX
Environmental Assessment	• Environmental Impact Statement for the Central Queensland Gas Pipeline for Enertrade • Environmental Impact Statement for the Townsville South Power Station for Enertrade • Environmental Impact Statement for the Nickel Slurry Pipeline for Gladstone Pacific Nickel • Tarong Coal Mine environmental gap analysis

Sandrine Martinez

Environmental Scientist

Profile

Sandrine is a graduate environmental scientist who is experienced in research and report writing with specialist expertise in bat groups. She has undertaken bat and frog surveys in Queensland and presented at an international symposium on bat research.

Sandrine maintains her connection with environmental research through part-time roles as a tutor at the Queensland University of Technology and providing technical assistance at the Queensland Museum. She brings her research capability to her work as a consulting environmental scientist, undertaking desktop ecological reviews, data interpretation and research. Sandrine also assists in preparing permit applications and EIS compilation for infrastructure projects, particularly in the gas and energy sectors.

Qualifications

Doctor of Philosophy (Palaeoecology)	Queensland University of Technology
Bachelor of Applied Science (Honours Geology)	Queensland University of Technology
Bachelor of Science (Marine Biology)	Griffith University
Vocational Training Certificate (Executive Assistant)	Lycée de Montgeron - France

Grants and scholarships

QUT Travel Grants-in-Aid 2007, XIVth International Bat Research Conference and 34th North American Symposium on Bat Research, Mérida Yucatán, México (A$1,997)

QUT International Doctoral Scholarship (QIDS); 2005-2009 (A$42,000)

Affiliations

Member of the Australian Bat Society and Australian National Geographic

Papers & Publications

Oral presentation	XIVth International Bat Research Conference and 34th North American Symposium on Bat Research, Mérida Yucatán, México (19 – 23 August 2007)
Oral presentation	11th Conference on Australasian Vertebrate Evolution Palaeontology and Systematics, Melbourne, Australia (10 – 13 April 2007)
Poster	Riversleigh Symposium, Sydney, Australia (27 – 29 November 2006)
“Battle for bats”	Queensland University of Technology Alumni Magazine (Australia)

Career Summary

2008 – current	Unidel Group Pty Ltd - Environmental Scientist
2006 – 2009	Queensland University of Technology - Tutoring/Demonstrating
2003 – 2004	Queensland Museum (Fossil Collection) - Honorary Technical Assistant
1998 – 2003	Short-term Executive Assistant assignments to organisations in France: Groupe Eurosearch, Fortis Investments, Ineum Consulting, Deloitte Touche Tohmatsu, Orsid Production

Areas Of Expertise

- Desktop research
- Report writing
- Fauna surveys
- Permit applications and EIS compilation

Relevant Experience

Gas Industry

- Desktop ecological reviews, data interpretation and report writing for a number of gas pipeline projects in Queensland including:
    - Queensland Curtis LNG Project (QGC)

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Sandrine Martinez
Environmental Scientist

- Ruby Braemar Pipeline (ERM Power)
- Newstead to Bulla Park Pipeline (APA Group)
- Wambo to Goondiwindi Pipeline (ERM Power)
- Wallumbilla to Wambo Pipeline (ERM Power)
- Spring Gully Lateral Project (Jemena)

- Assisting field ecologist and botanist in flora and fauna field assessment for several gas pipeline projects including:
  - Queensland Curtis LNG Project
  - Newstead to Bulla Park Pipeline (APA Group)
  - Wambo to Goondiwindi Pipeline (ERM Power)
  - Wallumbilla to Wambo Pipeline (ERM Power)
- Addressing public and agencies' comments following the release of the Draft EIS for the Queensland Curtis LNG EIS
- Literature review of environmentally significant areas and features for the Queensland Curtis LNG EIS
- Identification of community organisations and stakeholders and description of social characteristics for the Lions Way Gas Pipeline

Mining Industry
- Desktop ecological reviews, data interpretation and identification of survey sites for the Galilee-Coal Project (Waratah Coal)

Fauna surveys
- Bat survey including use of harp traps and mist-netting, Brooklyn (Queensland)
- Caving at Mount Etna, Australia for retrieving fossil bats as part of PhD research
- Endangered frog survey (e.g., *Mixophyes* sp.), Connondale Ranges, SEQ

Tutoring
- Science concepts and global systems
- Plant and animal physiology
- History of life on Earth

Additional Skills and Capabilities

- Use of Trimble Nomad PDA and GBM Mobile 5.10
- First Aid Certificate – Perform CPR, provide basic emergency life support, and apply first aid (September 2009)
- 4WD Certificate II - Operate Four Wheel Drive Vehicle (June 2009)

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Ruth Smith
Environmental Scientist

Profile

Ruth is providing environmental assessment, management and compliance support while she completes her university studies. After graduating from her Environmental Management degree (Hons), Ruth chose to further her qualifications and began a Bachelor of Law at the University of Queensland. She has successfully completed 3 years of her law degree and expects to finish her final year of law by Nov 2010.

Ruth has a broad knowledge of the legal and environmental jurisdictions through studies and work experience. She prides herself on her strong work ethic and her willingness to perform to the best of her ability in every task undertaken.

Qualifications

Bachelor of Law – 25 subjects completed	University of Queensland, Australia
Bachelor of Environmental Management (Sustainable Development) (Hons)	University of Queensland, Australia

Awards

Received the Dean's Commendation for High Achievement on four separate occasions.

Career Summary

2008 - current	Unidel Group - Environmental Scientist
2007 – current	Bachelor of Law - Contract, Torts, Environmental Law, Planning Law
2003 – 2006	Bachelor of Environmental Management (Sustainable Development) (Hons)
2005 – 2006	WBM Oceanics - Springhill Research Officer

Areas Of Expertise

- Qualitative and quantitative research
- Environmental assessment support
- Reporting writing
- Community consultation support

Relevant Experience

Queensland Curtis LNG Project (QGC)	• Principal author of Ecological studies incorporated into the pipeline and gas field components of the EIS. • Principal author of Ecological studies incorporated into the pipeline and gas field components of the Supplementary EIS. • Co-author of Supplementary EIS. • Co-author of Addendum Environmental Assessment for Alternative Gas Collection Header • Assisted in the preparation of an environmental approval schedule for the gas field component of the Queensland Curtis LNG Project (QGC).
Gas Corridor Projects	• Metgasco- Casino to Ipswich Pipeline: Co-author of Section 3A Major Project Environmental Assessment (NSW), Level 2 Petroleum Environmental Assessment (QLD) and EPBC Public Environment Report (Cth) • ERM Power- Ikon to Wambo Pipeline: EPBC Referral. • Queensland Gas Pipeline Looping Project (A J Lucas): Provided in regards to the management of Parthenium Weed (i.e. washdown locations) to be incorporated into the Construction Environmental Management Plan (CEMP)
Mining and Extractive Industries Projects	• Waratah Coal- Galilee Project: Assisted ecologist and botanist during field assessment. • Abbot Point Stage 3 Coal Terminal Expansion EIS (Ports Corporation of Queensland): Provided research support, part of which, involved extensive community consultation.
Land Management	• Ecological Impact Study (Noosa Shire Council): Provided research support and co-authored an ecological impact study of the affects of vehicular traffic along Noosa North Shore.

Appendix 3 – Vegetation Survey Proformas

VEGETATION SURVEY

Eucalyptus populnea Woodland on Sand Plains
BB01

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.12**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	Not linear

Site Description	
Location:	Glen Innes, central-western Queensland
Site Description:	Eastern section of Bimblebox Nature Reserve
Orientation of Transect:	200°
Datum:	WGS84
Latitude / Longitude:	-23.4244; 146.4214

Vegetation Community Description

Eucalyptus populnea dominated woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 3-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus populnea	D		16	5						7	1	
Eucalyptus melanophloia	A		18									
Eucalyptus dallachyana	A		16									
Petalostigma pubescens	A					4						

Vegetation Community Description												
Acacia sp.					5							
Myoporum acuminatum						3						
Geigera parviflora						4						
Grevillea striata						3						
Archidendropsis basaltica						3						
Carissa ovata							1					
Erythoxylon australe							2					
Capparis lasiantha							3					
Psydrax oleifolius							2					
Buraria spinosa							3					
Styloanthes scabra								1				
Heteropogon contortus								1				
Pennisetum ciliare	#							0.5				
Melinis repens	#							1				
Enneapogon acicularis								0.5				
Aristida spp.								0.5				
Perotis rara								0.10				
Themeda triandra								1				
Triodia pungens								0.5				
% Rock	0	% Bare ground	10 - 15		% Leaf litter	5-10		% Cryptogram	30			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant												

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	7				*Eucalyptus populnea*		3					25	35
	5				*Eucalyptus melanophloia*		1					10	

Community Health and Condition	
Overall Health:	Very Good
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	5 – 10

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Pale yellow
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB01
Date / Time:	11 / 04 / 2010; 11.30 am

VEGETATION SURVEY

Eucalyptus melanophloia Open Woodland on Sand Plains
BB02

Regional Ecosystem Profile	
Regional Ecosystem Type:	**10.5.5**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	non linear

Site Description	
Location:	Glen Innes, central western Queensland
Site Description:	Western edge of Bimblebox Nature Reserve
Orientation of Transect:	30º
Datum:	WGS 84
Latitude / Longitude:	-23.456, 146.344

Vegetation Community Description

Eucalyptus melanophloia dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus melanophloia			16									
Eucalyptus populnea			14									
Brachychiton australis			12									
Archidendropsis basaltica						3						

Vegetation Community Description												
Petalostigma pubescens						2						
Carissa lanceolata						1						
Erythoxylum australe						1.5						
Acacia sp.						2						
Psydrax odorata						2						
Themeda triandra								1				
Aristida spp.								0.5				
Heteropogon contortus								0.5				
Dactyloctenium australe								0.2				
Triodia pungens								0.3				
Pennisetum ciliare								0.5				
Melinus repens								0.5				
% Rock		% Bare ground	25		% Leaf litter	5		% Cryptogram	15			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant												

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	9				Eucalyptus *melanophloia*		5					6.8	6.8
	1				Eucalyptus populnea		2						
		1			Archidendropsis basaltica			1				3.5	
					Grevillea striata					2		2.5	
					Eremophila mitchellii					2			
					Psydrax odorata					1			

Community Health and Condition	
Overall Health:	Average
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, D australe*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Sand plain
Altitude:	250-500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very gently inclined (1-3%)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB02
Date / Time:	11 / 4 / 2010; 10.00 am

VEGETATION SURVEY

Eucalyptus melanophloia Woodland on Sand Plains
BB03

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.5**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	Not linear

Site Description	
Location:	Glen Innes, central-western Queensland
Site Description:	Eastern section of Bimblebox Nature Reserve
Orientation of Transect:	80°
Datum:	WGS84
Latitude / Longitude:	-23.4416; 146.3441

Vegetation Community Description

Eucalyptus melanophloia dominated woodland to 16-18m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 2-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	A		16							7		
Eucalyptus melanophloia	D		18									
Petalostigma pubescens	A					4						
Acacia sp.	A				5							
Geigera parviflora	A					4						
Archidendropsis	A					3						

Vegetation Community Description													
basaltica													
Carissa ovata	A						1						
Erythoxylon australe	A						2						
Psydrax oleifolius	A						2						
Styloanthes scabra	#							1					
Heteropogon contortus	C							1					
Pennisetum ciliare	#							0.5					
Melinis repens	#							1					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Perotis rara	A							0.10					
Themeda triandra	C							1					
Triodia pungens	A							0.5					
Opuntia tomentosa	#							0.5					
% Rock	0	% Bare ground	5	% Leaf litter	5-10	% Cryptogram	30						
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	22				*Eucalyptus melanophloia*		29					26	26
					Psydrax odorata					1			

Community Health and Condition	
Overall Health:	Average, regrowth after drought
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, Opuntia tomentose*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB03
Date / Time:	11 / 04 / 2010; 9.10 am

VEGETATION SURVEY

Eucalyptus melanophloia Open Woodland on Sand Plains
BB04

Regional Ecosystem Profile	
Regional Ecosystem Type:	**10.5.5**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	non linear
Total Area of Vegetation:	

Site Description	
Location:	Glen Innes, central western Queensland
Site Description:	Western edge of Bimblebox Nature Reserve
Orientation of Transect:	30º
Datum:	WGS 84
Latitude / Longitude:	-23.484722; 146.353056

Vegetation Community Description

Eucalyptus melanophloia dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 2 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus melanophloia			16									
Eucalyptus dalachyana			14									
Archidendropsis basaltica						3						
Petalostigma pubescens						2						

Vegetation Community Description													
Carissa lanceolata						1.5							
Erythoxylum australe						1.5							
Acacia sp.						3							
Bursaria spinosa						2							
Myoporum acuminatum						2							
Acacia juniperinum						3							
Apophyllum anomalon						2							
Psydrax odorata						1.5							
Themeda triandra								1					
Aristida spp.								0.5					
Heteropogon contortus								1					
Dactyloctenium australe	#							0.5					
Triodia pungens								0.5					
Pennisetum ciliare								0.5					
Melinus repens								0.5					
% Rock		% Bare ground	15		% Leaf litter	5		% Cryptogram	15				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Community Health and Condition	
Overall Health:	Average
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, D australe*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Sand plain
Altitude:	250-500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very gently inclined (1-3%)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB04
Date / Time:	20 / 10 / 2009; 10.00 am

VEGETATION SURVEY

Eucalyptus melanophloia Open Woodland on Sand Plains
BB05

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.5**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	Not linear

Site Description	
Location:	Glen Innes, central-western Queensland
Site Description:	North eastern section of Bimblebox Nature Reserve
Orientation of Transect:	170°
Datum:	WGS84
Latitude / Longitude:	-23.4191; 146.3695

Vegetation Community Description

Eucalyptus melanophloia dominated open woodland to 16-18 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-5 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and very few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	A		16							7		
Eucalyptus melanophloia	D		18									
Petalostigma pubescens	A					4						
Brachychiton populneus	A				5							

Vegetation Community Description													
Acacia sp.	A				5								
Geigera parviflora	A					4							
Grevillea striata	A					3							
Carissa ovata	A						1						
Erythoxylon australe	A						2						
Atalaya hemiglauca	A						2						
Psydrax oleifolius	A						2						
Stylosanthes scabra	#							1					
Heteropogon contortus	A							1					
Pennisetum ciliare	#							0.5					
Melinis repens	#							1					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Perotis rara	A							0.10					
Themeda triandra	D							1					
Triodia pungens	D							0.5					
Opuntia tomentosa	#							0.5					
% Rock	0	% Bare ground	10 - 15		% Leaf litter	5-10		% Cryptogram	30				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	9				*Eucalyptus melanophloia*		3					25	3
	5				*Eucalyptus populnea*		1					10	5

Community Health and Condition	
Overall Health:	Very Good
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, Opuntia tomentose*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Sand plain
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB05
Date / Time:	10 / 04 / 2010; 5.15 pm

VEGETATION SURVEY

Acacia shirleyi Woodland on Sandstone Ranges
BB06

Regional Ecosystem Profile	
Regional Ecosystem Type:	**10.10.1a**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.10.1a / 10.10.4a. / 10.7.3a / 10.7.5
Width of RE:	non linear

Site Description	
Location:	Cavendish Station, central western Queensland
Site Description:	Edge of sandstone escarpment
Orientation of Transect:	30º
Datum:	WGS 84
Latitude / Longitude:	-23.3691, 146.2973

Vegetation Community Description

Acacia shirleyi dominated woodland to 8-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 2 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Acacia shirleyi	D		16									
Acacia decora	A					2						
Alstonia constricta	A					3						
Eucalyptus thozetiana	A		8									
Carissa lanceolata	A					1.5						
Erythoxylum australe	A					1.5						
Eremophlia mitchellii						2						
Acacia sp.	A					3						
Bursaria spinosa	A					2						
Themeda triandra	A							1				

Vegetation Community Description													
Aristida spp.		A							0.5				
Heteropogon contortus		A							1				
Triodia pungens		A							0.5				
Pennisetum ciliare		#							0.5				
% Rock	20	% Bare ground		15		% Leaf litter		15		% Cryptogram		5	
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Community Health and Condition	
Overall Health:	Average
Potential EVR Flora Species Habitat:	Yes
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Rocky slope
Altitude:	250-500 m
Relief:	Low
Slope:	Flat
Slope Class:	Gently inclined (10%)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Skeletal rocky Sand
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Consolidated sedimentary rocks

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB06
Date / Time:	20 / 10 / 2009; 10.00 am

VEGETATION SURVEY

Eucalyptus melanophloia Open Woodland on Alluvial Plains
BB07

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.28**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.3.28 / 10.3.27 / 10.3.14
Width of RE:	Not linear

Site Description	
Location:	Cavendish Station, central-western Qld
Site Description:	EPC 1079
Orientation of Transect:	200°
Datum:	WGS84
Latitude / Longitude:	-23.4416; 146.2720

Vegetation Community Description

Eucalyptus melanophloia dominated woodland to 15-18 m tall. Canopy is open to sparse. Low tree / shrub layer is very sparse to 1-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	A		16							7		
Eucalyptus melanophloia	D		18									
Eucalyptus dallachyana	A		15									
Persoonia falcata	A					4						
Acacia sp.	A					3						
Petalostigma	A					3						

Vegetation Community Description													
pubescens													
Alphitonia exselsa	A					3							
Carissa ovata	A						1						
Erythoxylon australis	A						2						
Psydrax oleifolius	A						2						
Stylosanthes scabra	#							1					
Heteropogon contortus	D							1					
Pennisetum ciliare	#							0.5					
Melinis repens	#							1					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Themeda triandra	C							1					
Lomandra leucocephala	A							0.5					
Triodia pungens	A							0.5					
% Rock	0	% Bare ground	25		% Leaf litter	5		% Cryptogram	20				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	11				*Eucalyptus melanophloia*		3					10	10
	1				*Eucalyptus populnea*								
	1				*Brachychiton populneus*								

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<5

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Fine grained alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB07
Date / Time:	12 / 04 / 2010; 8.30 am

VEGETATION SURVEY

Eucalyptus populnea Open Woodland on Sand Plains
BB08

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.12**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	Not linear

Site Description	
Location:	Cavendish Station, central-western Queensland
Site Description:	EPC 1079
Orientation of Transect:	200°
Datum:	WGS84
Latitude / Longitude:	-23.4797; 146.2921

Vegetation Community Description

Eucalyptus melanophloia dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status *	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		14							7		
Eucalyptus melanophloia	A		16									
Bursaria spinosa						3						

Vegetation Community Description													
Petalostigma pubescens						4							
Acacia decora.						2							
Myoporum acuminatum						3							
Geigera parviflora						4							
Grevillea striata						3							
Carissa ovata							1						
Psydrax oleifolius							3						
Bursaria spinosa							3						
Stylosanthes scabra	#							1					
Heteropogon contortus								1					
Pennisetum ciliare	#							0.5					
Melinis repens	#							1					
Enneapogon acicularis								0.5					
Aristida spp.								0.5					
Eragrostis spp.								0.10					
Themeda triandra								1					
Triodia pungens								0.5					
% Rock	0	% Bare ground		10 - 15		% Leaf litter	5-10		% Cryptogram		30		
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures														
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	4				*Eucalyptus melanophloia*		4					3	10
	11				*Eucalyptus populnea*		3					7	
					Bursaria spinosa					17			
					Carissa ovata						2		

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<5

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Pale yellow
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris

Field Site Number:	BB08
Date / Time:	12 / 04 / 2010; 1.30 pm

VEGETATION SURVEY

Eucalyptus populnea Open Woodland on Sand Plains
BB09

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.12**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	Not linear

Site Description	
Location:	Cavendish Station, central-western Queensland
Site Description:	EPC 1079
Orientation of Transect:	200°
Datum:	WGS84
Latitude / Longitude:	-23.5085; 146.3177

Vegetation Community Description

Eucalyptus populnea dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and many few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		14							7		
Eucalyptus melanophloia	A		16									
Bursaria spinosa	A					3						
Petalostigma pubescens	A					4						

Vegetation Community Description													
Acacia decora.	A					2							
Carissa ovata	A						1						
Psydrax oleifolius	D						3						
Bursaria spinosa	A						3						
Stylosanthes scabra	#							1					
Heteropogon contortus	A							1					
Pennisetum ciliare	#							0.5					
Melinis repens	#							1					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Eragrostis spp.	A							0.10					
Themeda triandra	D							1					
Triodia pungens	A							0.5					
% Rock	0	% Bare ground	60		% Leaf litter	<10		% Cryptogram	30				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	3				*Eucalyptus melanophloia*								8
	4				*Eucalyptus populnea*		5					8	
					Psydrax oleifolius					11			

Community Health and Condition	
Overall Health:	Average
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, Opuntia tomentosa, Stylosanthes scabra*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<5

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB09
Date / Time:	12 / 04 / 2010, 2.10 pm

VEGETATION SURVEY

Acacia harpophylla and / or Eucalyptus cambadgeana open woodland on Cainozoic lake beds
BB10

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.4.3**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Endangered**
DNRW Mapped as:	10.4.3
Width of RE:	Not linear

Site Description	
Location:	Lambton Meadows Station, central-western Queensland
Site Description:	EPC 1079
Orientation of Transect:	330°
Datum:	WGS84
Latitude / Longitude:	-23.4843; 146.3977

Vegetation Community Description

Eucalyptus populnea dominated open woodland to 12 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and many stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Acacia harpophylla	D		12									
Lysicarpus angustifolius	A		12									
Geigera parvifolia	A					3						
Carissa ovata	A					4						

Vegetation Community Description													
Alectryon oleifolius	A					2							
Carissa ovata	A						1						
Stylosanthes scabra	#							1					
Heteropogon contortus	A							1					
Pennisetum ciliare	#							0.5					
Aristida spp.	A							0.5					
Eragrostis spp.	A							0.10					
Themeda triandra	A							1					
% Rock	0	% Bare ground	90		% Leaf litter	<5		% Cryptogram	5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	16				*Acacia harpophylla*		17					40	45
					Lysicarpus angustifoliuis							5	
					Giegera parviflora					4			
					Carissa ovata						10		

Community Health and Condition	
Overall Health:	Poor, very degraded
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, Stylosanthes scabra*
Weed Cover (%):	< 5
Disturbance:	grazing, feral animals, introduced flora
Disturbance Cover (%):	25

Topography and Landform	
Landform Situation:	Shallow depression
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Grey
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB10
Date / Time:	13 / 04 / 2010; 10.10 am

VEGETATION SURVEY

Eucalyptus populnea Open Woodland on Alluvial Plains
BB11

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.27a**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.4.3 / 10.3.27
Width of RE:	Linear

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	340°
Datum:	WGS84
Latitude / Longitude:	-23.4584; 146.4526

Vegetation Community Description

Eucalyptus populnea dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus populnea	D		14							7		
Eucalyptus melanophloia	A		16									
Bursaria spinosa	A					3						
Petalostigma pubescens	A					4						
Acacia decora.	A					2						

Vegetation Community Description													
Carissa ovata	A						1						
Psydrax oleifolius	D						3						
Bursaria spinosa	A						3						
Stylosanthes scabra	#							1					
Heteropogon contortus	A							1					
Pennisetum ciliare	#							0.5					
Melinis repens	#							1					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Eragrostis spp.	A							0.10					
Themeda triandra	D							1					
Triodia pungens	A							0.5					
% Rock	0	% Bare ground	60		% Leaf litter		<10		% Cryptogram		30		
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	3				*Eucalyptus melanophloia*								8
	4				*Eucalyptus populnea*		5					8	
					Psydrax oleifolius					11			

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, Opuntia tomentosa, Stylosanthes scabra.*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<5

Topography and Landform	
Landform Situation:	Sand plain near small stream.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB11
Date / Time:	12 / 04 / 2010; 12.52 am

VEGETATION SURVEY

Acacia harpophylla Open Woodland on Alluvial Plains
BB12

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.3**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.3.3 / 10.3.4 / 10.3.25
Width of RE:	Linear

Site Description	
Location:	Northern edge of Kia Ora Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	350°
Datum:	WGS84
Latitude / Longitude:	-23.3343; 146.4965

Vegetation Community Description

Acacia harpophylla dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-2 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and many stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Acacia harpophylla	D		14							7		
Carissa ovata	A					1						
Stylosanthes scabra	#							1				
Heteropogon contortus	A							1				
Pennisetum ciliare	#							0.5				
Melinis repens	#							1				
Enneapogon acicularis	A							0.5				

Vegetation Community Description													
Aristida spp.		A							0.5				
Eragrostis spp.		A							0.10				
Themeda triandra		D							1				
Triodia pungens		A							0.5				
Geigera parviflora		A					2						
Encylaena tomentosa		A							0.5				
% Rock	0	% Bare ground	60			% Leaf litter	<10			% Cryptogram	30		
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	3				*Eucalyptus melanophloia*								8
	4				*Eucalyptus populnea*		5					8	
					Psydrax oleifolius					11			

Community Health and Condition	
Overall Health:	Poor, evidence of recent (<12 mths) fires.
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, Opuntia tomentosa, Stylosanthes scabra.*
Weed Cover (%):	30
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	10-15

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Grey
Soil Texture:	Clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB12
Date / Time:	12 / 04 / 2010; 8.45 am

VEGETATION SURVEY

Eucalyptus populnea Open Woodland on Alluvial Plains
BB13

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.27**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.4.3 / 10.3.27
Width of RE:	Linear

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	80°
Datum:	WGS84
Latitude / Longitude:	-23.4543; 146.4490

Vegetation Community Description

Eucalyptus populnea dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-4m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and many few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status *	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T 3
Eucalyptus populnea	D		14							7		
Carissa ovata	A					1						
Acacia harpophylla	A		8									
Petalostigma pubescens	A					3						
Geigera parviflora	A					2						
Lysicarpus angustifolius	A					4						

Vegetation Community Description													
Eremophlia mitchellii	A					2							
Psydrax oleifolius	D					3							
Bursaria spinosa	A					3							
Stylosanthes scabra	#							1					
Heteropogon contortus	A							1					
Pennisetum ciliare	#							0.5					
Melinis repens	#							1					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Eragrostis spp.	A							0.10					
Themeda triandra	D							1					
Triodia pungens	A							0.5					
% Rock	0	% Bare ground	60		% Leaf litter	<10		% Cryptogram	30				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	3				*Eucalyptus melanophloia*								8
	4				*Eucalyptus populnea*		5					8	
					Psydrax oleifolius					11			

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, Opuntia tomentosa, Stylosanthes scabra.*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<5

Topography and Landform	
Landform Situation:	Sand plain near small stream.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB13
Date / Time:	12 / 04 / 2010; 12.52 am

VEGETATION SURVEY

Eucalyptus populnea Woodland on Alluvial Plains
BB14

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.27**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.3.27 / 10.3.2 / 10.3.3
Width of RE:	

Site Description	
Location:	Glenn Innes Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	40°
Datum:	WGS84
Latitude / Longitude:	-23.4323; 146.4357

Vegetation Community Description

Eucalyptus populnea dominated woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and many stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		14							7		
Eucalyptus melanophloia	A		16									
Bursaria spinosa	A					3						
Petalostigma pubescens	A					4						
Acacia decora.	A					2						
Carissa ovata	A						1					

Vegetation Community Description													
Psydrax oleifolius	D						3						
Bursaria spinosa	A						3						
Stylosanthes scabra	#							1					
Heteropogon contortus	A							1					
Pennisetum ciliare	#							0.5					
Melinis repens	#							1					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Eragrostis spp.	A							0.10					
Themeda triandra	D							1					
Triodia pungens	A							0.5					
% Rock	0	% Bare ground	15		% Leaf litter	15		% Cryptogram	20				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	8				*Eucalyptus melanophloia*		8						8
				1	*Acacia decora*					1			

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, Opuntia tomentosa, Stylosanthes scabra.*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<5

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB14
Date / Time:	11 / 04 / 2010; 10.00 am

VEGETATION SURVEY

Eucalyptus populnea Woodland on Alluvial Plains
BB15

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.27**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.3.27 / 10.3.2 / 10.3.3
Width of RE:	

Site Description	
Location:	Glenn Innes Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	170°
Datum:	WGS84
Latitude / Longitude:	-23.4171; 146.4460

Vegetation Community Description

Eucalyptus populnea dominated woodland to 12-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 2-4m tall dominated by *Eremophila mitchellii*. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		14							7		
Eucalyptus melanophloia	A		16									
Lysiphyllum carronii	A					4						
Eremophila mitchellii	A						3					

Vegetation Community Description													
Acacia decora.	A						2						
Carissa ovata	A							1					
Psydrax oleifolius	D						3						
Bursaria spinosa	A						3						
Geigera parviflora	A						3						
Erythoxylon australe	A						2						
Atalaya hemiglauca	A						3						
Grevillea striata	A					4							
Stylosanthes scabra	#							1					
Heteropogon contortus	A							1					
Pennisetum ciliare	#							0.5					
Opuntia tomentosa	#							0.5					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Eragrostis spp.	A							0.10					
Themeda triandra	D							1					
Triodia pungens	A							0.5					
% Rock	0	% Bare ground	20			% Leaf litter	5		% Cryptogram		20		
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	5				*Eucalyptus populnea*								8
				4	*Eremophila mitchellii*					11			
					Acacia decora					1			
					Bursaria spinosa					1			
					Dodonaea viscosa					7			

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum. ciliare, Opuntia tomentosa, Stylosanthes scabra..*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals
Disturbance Cover (%):	<1

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB14
Date / Time:	11 / 04 / 2010; 17.15 pm

VEGETATION SURVEY

Eucalyptus melanophloia Woodland on Sand Plains
BB16

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.12**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	

Site Description	
Location:	Glenn Innes Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	170°
Datum:	WGS84
Latitude / Longitude:	-23.4077; 146.3979

Vegetation Community Description

Eucalyptus populnea dominated woodland to 16-18 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 2 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		14							7		
Eucalyptus melanophloia	C		16									
Corymbia dallachyana	A		12									
Acacia decora.	A					2						
Carissa ovata	A							1				
Psydrax oleifolius	D					3						

Vegetation Community Description												
Geigera parviflora	A					3						
Erythoxylon australe	A					2						
Atalaya hemiglauca	A					3						
Archidendropsis basaltica	A					2						
Acacia juncifolia	A					3						
Myoporum acuminatum	A					3						
Stylosanthes scabra	#							1				
Heteropogon contortus	A							1				
Pennisetum ciliare	#,D							0.5				
Chrysopogon fallax	A							1				
Enneapogon acicularis	A							0.5				
Aristida spp.	A							0.5				
Eragrostis spp.	A							0.10				
Themeda triandra	D							1				
Sporobolus sp.												
Cyperus sp.												
Triodia pungens	A							0.5				
% Rock	0	% Bare ground	15	% Leaf litter	5	% Cryptogram	20					
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant												

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	14				*Eucalyptus melanophloia*		3						20

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	Yes
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum. ciliare, Opuntia tomentosa, Stylosanthes scabra..*
Weed Cover (%):	30
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<1

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Yellow / brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB16
Date / Time:	10 / 04 / 2010; 16.15

VEGETATION SURVEY

Eucalyptus populnea Woodland on Sand Plains
BB17

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.12**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	

Site Description	
Location:	Glenn Innes Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	100°
Datum:	WGS84
Latitude / Longitude:	-23.4042; 146.3970

Vegetation Community Description

Eucalyptus populnea dominated woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 2 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		14							7		
Eucalyptus melanophloia	C		16									
Corymbia dallachyana	A		12									
Acacia decora.	A					2						
Carissa ovata	A							1				
Psydrax oleifolius	D					3						
Geigera parviflora	A					3						

Vegetation Community Description													
Erythoxylon australe	A							1					
Atalaya hemiglauca	A					3							
Archidendropsis basaltica	A					2							
Eremophila mitchellii	A					3							
Myoporum acuminatum	A					3							
Stylosanthes scabra	#							1					
Heteropogon contortus	A							1					
Pennisetum ciliare	#,D							0.5					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Eragrostis spp.	A							0.10					
Themeda triandra	D							1					
Sporobolus sp.													
Cyperus sp.													
Triodia pungens	A							0.5					
% Rock	0	% Bare ground	15		% Leaf litter	50		% Cryptogram	10				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	19				*Eucalyptus populnea*		13						20
					Psydrax oleifolia					1		1	

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	Yes
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare, Stylosanthes scabra.*
Weed Cover (%):	40
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<1

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB16
Date / Time:	10 / 04 / 2010; 16.50

VEGETATION SURVEY

Eucalyptus populnea Woodland on Sand Plains
BB18

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.12**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.12 / 10.5.5
Width of RE:	Not linear

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	Flat plain
Orientation of Transect:	200°
Datum:	WGS84
Latitude / Longitude:	-23.5036; 146.5343

Vegetation Community Description

Eucalyptus populnea dominated woodland to 16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		16							7	1	
Eucalyptus dallachyana	A		16									
Petalostigma pubescens	A					4						
Acacia sp.					5							
Myoporum acuminatum						3						
Geigera parviflora						4						
Grevillea striata						3						
Archidendropsis basaltica						3						
Carissa ovata							1					
Erythoxylon australe							2					

Vegetation Community Description												
Capparis lasiantha							3					
Psydrax oleifolius							2					
Styloanthes scabra	#							1				
Heteropogon contortus								1				
Pennisetum ciliare	#							0.5				
Aristida spp.								0.5				
Themeda triandra								1				
Triodia pungens								0.5				
% Rock	0	% Bare ground	10		% Leaf litter	5		% Cryptogram	10			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant												

Community Health and Condition	
Overall Health:	Very Good
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	5 – 10

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Pale yellow
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB18
Date / Time:	22 / 10 / 2009; 11.30 am

VEGETATION SURVEY

Non remnant
BB19

Regional Ecosystem Profile	
Regional Ecosystem Type:	**Non remnant**
EPBC Status:	**n / a**
VMA Status:	**n / a**
EPA Status:	**n / a**
DNRW Mapped as:	11.3.27 / 11.5.5
Width of RE:	Not linear

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	Open pasture land
Orientation of Transect:	0°
Datum:	WGS84
Latitude / Longitude:	-23.4762; 146.5182

Vegetation Community Description
Cleared and stick raked in the past 2-5 years. Now invaded by pasture grasses. Re-growth of *Acacia* spp.

Community Health and Condition	
Weed Species:	*P. ciliare*
Weed Cover (%):	>95
Disturbance:	fencing, grazing, feral animals, introduced flora, extensive vegetation clearand and blade ploughing
Disturbance Cover (%):	100

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB19
Date / Time:	22 / 10 / 2009; 1200

VEGETATION SURVEY

Eucalyptus melanophloia Open Woodland on Sand Plains
BB20

Regional Ecosystem Profile	
Regional Ecosystem Type:	**10.5.5**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12 / 11.3.27
Width of RE:	Non linear

Site Description	
Location:	Monklands Station, central western Queensland
Site Description:	Gently sloping sandy plain
Orientation of Transect:	30º
Datum:	WGS 84
Latitude / Longitude:	-23.4279, 146.5202

Vegetation Community Description

Eucalyptus melanophloia dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 2 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and many stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus melanophloia	D		16									
Eucalyptus dalachyana	A		14									
Petalostigma pubescens	A					3						
Carissa lanceolata	A							1				
Callitris glauca	A				6							
Acacia decora	A					2						
Psydrax odorata	A					2						
Erythoxylon australe	A							1				
Themeda triandra	A							1				
Aristida spp.	D							0.5				
Heteropogon contortus	C							1				
Dactyloctenium australe	#A							0.5				

Vegetation Community Description													
Triodia pungens		C							0.5				
Pennisetum ciliare		#A							1				
Melinus repens		#A							0.5				
Sida sp.		A							1				
% Rock		% Bare ground	60		% Leaf litter	10		% Cryptogram	5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Sand plain
Altitude:	250-500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very gently inclined (1-3%)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB20
Date / Time:	22 / 10 / 2009; 10.00 am

VEGETATION SURVEY

Eucalyptus melanophloia Woodland on Sand Plains
BB21

Regional Ecosystem Profile	
Regional Ecosystem Type:	**No longer remnant. Destroyed by fire.**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	**RE 10.5.5 / 10.5.12 / 10.3.3**
Width of RE:	

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	300°
Datum:	WGS84
Latitude / Longitude:	-23.4457, 146.4877

Vegetation Community Description

Previously a *Eucalyptus melanophloia* dominated woodland. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus melanophloia	D		2									
Stylosanthes scabra	#							1				
Heteropogon contortus	A							1				
Pennisetum ciliare	#,D							0.5				
Aristida spp.	A							0.5				
Themeda triandra	D							1				

% Rock	0	% Bare ground	30	% Leaf litter	20	% Cryptogram	0		

Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	18				*Eucalyptus melanophloia*		13						-

Community Health and Condition	
Overall Health:	Regenerating from fire
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare, Stylosanthes scabra.*
Weed Cover (%):	90
Disturbance:	Fire, fencing, grazing, feral animals, introduced flora, vegetation dieback
Disturbance Cover (%):	<90

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB21
Date / Time:	14 / 04 / 2010; 10.00

VEGETATION SURVEY

Eucalyptus populnea Open Woodland on Alluvial Plains
BB22

Regional Ecosystem Profile	
Regional Ecosystem Type:	**10.3.27**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.4.3 / 10.3.27
Width of RE:	non linear

Site Description	
Location:	Glen Innes, central western Queensland
Site Description:	Western edge of Bimblebox Nature Reserve
Orientation of Transect:	30º
Datum:	WGS 84
Latitude / Longitude:	-23.468886, 146.477743

Vegetation Community Description

Eucalyptus populnea dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus melanophloia	S		16									
Eucalyptus populnea	D		14									
Eucalyptus dallachyana	A		12									
Petalostigma pubescens	A					2						
Eremophila mitchellii	A					3						
Geigera parviflora	A					3						
Carissa lanceolata	A					1						

Vegetation Community Description												
Erythoxylum australe	A					1.5						
Acacia decora	A					2						
Acacia juncifolia	A					2						
Psydrax odorata	A					2						
Themeda triandra	A					1						
Aristida spp.	D					0.5						
Heteropogon contortus	A					1						
Dactyloctenium australe	#					0.5						
Triodia pungens	A					0.5						
Pennisetum ciliare	#A					1						
Melinus repens	#A					1						
% Rock		% Bare ground	25		% Leaf litter	5		% Cryptogram	15			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant												

Community Health and Condition	
Overall Health:	Average
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Sand plain
Altitude:	250-500 m
Relief:	Very low
Slope:	flat
Slope Class:	Very gently inclined (1-3%)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB22
Date / Time:	22 / 10 / 2010; 2.00 pm

VEGETATION SURVEY

Eucalyptus populnea Open Woodland on Sand Plains
BB23

Regional Ecosystem Profile	
Regional Ecosystem Type:	**10.4.3**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Endangered**
DNRW Mapped as:	10.4.3 / 10.3.27
Width of RE:	non linear

Site Description	
Location:	Monklands Station, central western Queensland
Site Description:	Flat sandy plain
Orientation of Transect:	30º
Datum:	WGS 84
Latitude / Longitude:	-23.4564, 146.4928

Vegetation Community Description

Eucalyptus populnea dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus melanophloia	A		16									
Eucalyptus populnea	D		14									
Corymbia clarksoniana	A		16									
Eucalyptus dalachyana	A		10									
Geigera parviflora	A					3						
Eremophila mitchellii	A					3						
Petalostigma pubescens	A					3						
Grevillea striata	A					3						

Vegetation Community Description													
Carissa lanceolata	A					1							
Erythoxylum australe	A					1							
Acacia sp.	A					2							
Psydrax odorata	A					2							
Themeda triandra	D					1							
Aristida spp.	A					0.5							
Heteropogon contortus	A					1							
Triodia pungens	A					0.5							
Pennisetum ciliare	#A					1							
% Rock		% Bare ground	10			% Leaf litter	10		% Cryptogram	15			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Community Health and Condition	
Overall Health:	Average
Potential EVR Flora Species Habitat:	*Desmodium macrocarpum*
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Sand plain
Altitude:	250-500 m
Relief:	Very low
Slope:	flat
Slope Class:	Very gently inclined (1-3%)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB23
Date / Time:	21 / 10 / 2009; 08.00 am

VEGETATION SURVEY

Eucalyptus camaldulensis Woodland along channels and floodplains BB24

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.14**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.5.5 / 10.5.12 / 10.3.27
Width of RE:	

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	190°
Datum:	WGS84
Latitude / Longitude:	-23.4145; 146.4898

Vegetation Community Description

Eucalyptus camaldulensis dominated woodland 16-24 m tall. Canopy is open. Low tree / shrub layer is sparse to 2 – 4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	A		14									
Eucalyptus camaldulensis	D		16									
Eucalyptus melanophloia	A		14									
Acacia decora.	A					2						
Acacia harpophylla	A					4						
Acacia salicina	A					3						
Carissa ovata	A							1				

Vegetation Community Description													
Geigera parviflora		A					3						
Erythoxylon australe		A							1				
Alphitonia excelsa		A					2						
Eremophila mitchellii		A					3						
Myoporum acuminatum		A					3						
Lysiphyllum carronii		A					4						
Stylosanthes scabra		#							1				
Heteropogon contortus		A							1				
Pennisetum ciliare		#,D							0.5				
Enneapogon acicularis		A							0.5				
Aristida spp.		A							0.5				
Eragrostis spp.		A							0.10				
Themeda triandra		D							1				
Chloris sp.		A							1				
Cyperus sp.		A							0.5				
Eragrostis sp.		A							0.5				
% Rock	0	% Bare ground	5		% Leaf litter	30		% Cryptogram	0				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	5				*Eucalyptus camaldulensis*		4					28	35
	14				*Eucalyptus populnea*		1					7	

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	Yes
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare, Stylosanthes scabra, Opuntia* sp.
Weed Cover (%):	5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<1

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Grey
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB16
Date / Time:	14 / 04 / 2010; 10.00

VEGETATION SURVEY

Acacia harpophylla* and / or *Eucalyptus cambadgeana
Open Woodland on Cainozoic lake beds
BB25

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.4.3**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Endangered**
DNRW Mapped as:	10.4.3 / 10.3.27
Width of RE:	

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	20°
Datum:	WGS84
Latitude / Longitude:	-23.3782; 146.4862

Vegetation Community Description

Acacia harpophylla dominated woodland 12-16 m tall. Canopy is open. Low tree / shrub layer is sparse to 3-4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus populnea	A		14									
Eucalyptus cambadgeana	A	22								1		
Eucalyptus melanophloia	A		14									
Acacia harpophylla	D		16			4				15		

Vegetation Community Description													
Acacia salicina	A					3							
Melaleuca viminalis	A					3							
Carissa ovata	A							1					
Geigera parviflora	A					3							
Stylosanthes scabra	#							1					
Hymenachne amplexicaulis	A							1.5					
Pennisetum ciliare	#,D							0.5					
Enneapogon acicularis	A							0.5					
Aristida spp.	A							0.5					
Monochoria cyanea	A							0.10					
Cyperus sp.	A							0.5					
Eragrostis sp.	A							0.5					
% Rock	0	% Bare ground	80		% Leaf litter	<5		% Cryptogram	0				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = , ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	23				*Acacia harpophylla*		15					28	37
5					*Eucalyptus cambadgeana*	1						9	

Community Health and Condition	
Overall Health:	Fair – heavily grazed
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare, Stylosanthes scabra, Opuntia* sp. *Hymenachne amplexicaulis.*
Weed Cover (%):	35
Disturbance:	fencing, grazing, feral animals
Disturbance Cover (%):	60

Topography and Landform	
Landform Situation:	Edge of depressiion.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Grey
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB25
Date / Time:	12 / 04 / 2010; 10.00

VEGETATION SURVEY

Acacia shirleyi Woodland on Plateau Margins
BB26

Regional Ecosystem Profile	
Regional Ecosystem Type:	**10.7.3**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.7.3 / 10.7.5 / 10.3.3
Width of RE:	non linear

Site Description	
Location:	Cavendish Station, central western Queensland
Site Description:	Edge of sandstone escarpment
Orientation of Transect:	30º
Datum:	WGS 84
Latitude / Longitude:	-23.3387, 146.3264

Vegetation Community Description

Acacia shirleyi dominated woodland to 12-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 2 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and a few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T 3
Acacia shirleyi	D		16									
Acacia decora	A					2						
Alstonia constricta	A					3						
Corymbia leichhardtii	A		15									
Carissa lanceolata	A					1.5						
Erythoxylum australe	A					1.5						
Eremophlia mitchellii	A					2						
Prostanthera leichhardtii	A					1						
Eucalyptus exserta	A		8									

Vegetation Community Description													
Eucalyptus crebra	A		12										
Themeda triandra	A							1					
Aristida spp.	A							0.5					
Heteropogon contortus	A							1					
Triodia pungens	A							0.5					
Pennisetum ciliare	#							0.5					
% Rock		% Bare ground			% Leaf litter		10		% Cryptogram		5		
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Community Health and Condition	
Overall Health:	Average
Potential EVR Flora Species Habitat:	Yes
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	< 5

Topography and Landform	
Landform Situation:	Rocky slope
Altitude:	250-500 m
Relief:	Low
Slope:	flat
Slope Class:	Gently inclined (10%)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Skeletal rocky Sand-lateritic
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Consolidated sedimentary rocks

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB26
Date / Time:	20 / 10 / 2009; 11.00 am

VEGETATION SURVEY

Eucalyptus populnea Open Woodland on Sand Plains
BB27

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.5.12**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**No Concern at Present**
DNRW Mapped as:	10.5.5 / 10.5.12
Width of RE:	

Site Description	
Location:	Glenn Innes Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	180°
Datum:	WGS84
Latitude / Longitude:	-23.4070; 146.3264

Vegetation Community Description

Eucalyptus populnea dominated woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse, 2 – 4 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus populnea	D		14									
Eucalyptus melanophloia	C		16									
Acacia decora.	A					2						
Carissa ovata	A							1				
Psydrax oleifolius	D					3						
Geigera parviflora	A					3						
Atalaya hemiglauca	A					3						

Vegetation Community Description												
Eremophila mitchellii	A					3						
Ventilago viminalis	A					3						
Grevillea striata	A					4						
Jasminum didymum	A					2						
Capparis lasiantha	A					2						
Scaevola spinescens	A							1				
Stylosanthes scabra	#							1				
Sida sp.	A							0.5				
Heteropogon contortus	A							1				
Pennisetum ciliare	#,D							0.5				
Enneapogon acicularis	A							0.5				
Aristida spp.	A							0.5				
Eragrostis spp.	A							0.10				
Themeda triandra	D							1				
Sporobolus sp.	A							1				
Cyperus sp.	A							0.5				
Triodia pungens	A							0.5				
Opuntia tomentosa	A#							0.5				
Calotis cuneifolia	A							0.5				
Chrysocephalum apiculatum	A							0.5				
Wahlenbergia gracilis	A							0.5				
Hybanthus monopetalus	A							0.5				
Murdannia graminea	A							0.5				
% Rock	0	% Bare ground	10		% Leaf litter	5		% Cryptogram		20		
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant												

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	8				*Eucalyptus populnea*		2						30
					Eremophila mitchellii					16		4	
					Scaevola spinescens						8	8	

Community Health and Condition	
Overall Health:	Good
Potential EVR Flora Species Habitat:	Yes
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum. ciliare, Opuntia tomentosa, Stylosanthes scabra..*
Weed Cover (%):	5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	<1

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)

Rock / Sediment Type:	Unconsolidated fine grained sediments
Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB27
Date / Time:	11 / 04 / 2010; 12.30

VEGETATION SURVEY

Non remnant
BB28

Regional Ecosystem Profile	
Regional Ecosystem Type:	**Non remnant**
EPBC Status:	**n / a**
VMA Status:	**n / a**
EPA Status:	**n / a**
DNRW Mapped as:	Non remnant
Width of RE:	Not linear

Site Description	
Location:	Kia ora Station, central-western Queensland
Site Description:	Open pasture land
Orientation of Transect:	270°
Datum:	WGS84
Latitude / Longitude:	-23.3442; 146.3803

Vegetation Community Description
Cleared, ploughed and planted to pasture. Grasses dominated by Buffel Grass (*Pennisetum ciliare*) with native grasses, *Heteropogon contortus* and *Themeda triandra*

Community Health and Condition	
Weed Species:	*P. ciliare, M. repens*
Weed Cover (%):	>95
Disturbance:	fencing, grazing, feral animals, introduced flora, extensive vegeration clearand and blade ploughing
Disturbance Cover (%):	100

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB28
Date / Time:	13 / 04 / 2010; 12.30

VEGETATION SURVEY

Non remnant
BB29

Regional Ecosystem Profile	
Regional Ecosystem Type:	**Non remnant**
EPBC Status:	**n / a**
VMA Status:	**n / a**
EPA Status:	**n / a**
DNRW Mapped as:	Non remnant
Width of RE:	Not linear

Site Description	
Location:	Kia ora Station, central-western Queensland
Site Description:	Open pasture land
Orientation of Transect:	0°
Datum:	WGS84
Latitude / Longitude:	-23.3669; 146.4220

Vegetation Community Description
Cleared, ploughed and planted to pasture. Grasses dominated by Buffel (*Pennisetum ciliare*) with native grasses, *Heteropogon contortus* and *Themeda triandra*

Community Health and Condition	
Weed Species:	*P. ciliare, M. repens*
Weed Cover (%):	>95
Disturbance:	fencing, grazing, feral animals, introduced flora, extensive vegetation clearand and blade ploughing
Disturbance Cover (%):	100

Topography and Landform	
Landform Situation:	Sand plain.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red
Soil Texture:	Sandy loam
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB29
Date / Time:	13 / 04 / 2010; 11.30

VEGETATION SURVEY

Eucalyptus populnea Open Woodland on Alluvial Plains
BB30

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.27.**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.3.27 / 10.3.12 / 10.3.3
Width of RE:	Linear

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	10°
Datum:	WGS84
Latitude / Longitude:	-23.3850; 146.4642

Vegetation Community Description

Eucalyptus populnea dominated open woodland to 14-16 m tall. Canopy is open to sparse. Low tree / shrub layer is sparse to 1 – 3 m tall. Open ground layer to 0.5 – 1 m tall of native and exotic grasses and forb species. Logs and few stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		14							7		
Eucalyptus camaldulensis	A		16									
Corymbia tesselaris	A		12			3						
Acacia salicina	A					3						
Petalostigma pubescens	A					3						
Acacia decora.	A					2						
Carissa ovata	A						1					

Vegetation Community Description													
Trema tomentosa	A						2						
Stylosanthes scabra	#A							1					
Grewia sp.	A							1					
Sida sp.	A							0.5					
Parsonsia sp.	A							1					
Ajuga australis	A							0.5					
Crinum flaccidum	A							0.5					
Phyllanthus sp.	A							0.5					
Heteropogon contortus	A							1					
Pennisetum ciliare	#D							0.5					
Melinis repens	#A							1					
Chrysopogon fallax	A							0.5					
Eulalia aurea	A							1					
Aristida spp.	A							0.5					
Eragrostis spp.	A							0.10					
Themeda triandra	D							1					
Triodia pungens	A							0.5					
% Rock	0	% Bare ground	60		% Leaf litter	<10		% Cryptogram	30				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	8				*Eucalyptus populnea*		9					28	52
	8				*Eucalyptus camaldulensis*		3					16	
	1				*Corymbia tesselaris*		2					8	

Community Health and Condition	
Overall Health:	Degraded
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*P. ciliare, M. repens, Opuntia tomentosa, Stylosanthes scabra.*
Weed Cover (%):	< 5
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	30

Topography and Landform	
Landform Situation:	Open depression near stream.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Black
Soil Texture:	Sandy clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB13
Date / Time:	13 / 04 / 2010; 0910

VEGETATION SURVEY

Eucalyptus populnea Open Forest on Alluvial Plains
BB31

Regional Ecosystem Profile	
Regional Ecosystem Type:	**RE 10.3.27.**
EPBC Status:	**n / a**
VMA Status:	**Least Concern**
EPA Status:	**Of Concern**
DNRW Mapped as:	10.3.27 / 10.3.12 / 10.3.3
Width of RE:	Linear

Site Description	
Location:	Monklands Station, central-western Queensland
Site Description:	EPC 1040
Orientation of Transect:	340°
Datum:	WGS84
Latitude / Longitude:	-23.4488; 146.4391

Vegetation Community Description

Eucalyptus populnea dominated open forest,14-16 m tall. Canopy is open. Low tree / shrub layer is sparse to absent. Open ground layer to 0.5 – 1 m tall of exotic grasses and forb species. Logs and stag trees present.

Dominant Species (50 m x 10 m area)

Botanical Species	Status*	Average Height (m)							Abundance (m^2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus populnea	D		14							7		
Corymbia tesselaris	A		12			3						
Pennisetum ciliare	#D							0.5				
Melinis repens	#A							1				
Stylosanthes scabra	#A											

Vegetation Community Description													
Themeda triandra		D							1				
Commelina diffusa		A							0.5				
Pseuderanthemum variabile		A							0.5				
% Rock	0	% Bare ground		60		% Leaf litter		<10		% Cryptogram		30	
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant													

Abundance measures													
Basal Area(0.5m x1cm gap)					**Species**	**Stem Count**(500m²)						**Cover**(%)	
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**	**PFC**	**CC**
	14				*Eucalyptus populnea*		8					52	66
	4				*Corymbia tesselaris*		4					14	

Community Health and Condition	
Overall Health:	Degraded
Potential EVR Flora Species Habitat:	No
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare, M. repens, Opuntia tomentosa, Stylosanthes scabra.*
Weed Cover (%):	60
Disturbance:	fencing, grazing, feral animals, introduced flora
Disturbance Cover (%):	60

Topography and Landform	
Landform Situation:	Open overbank near stream.
Altitude:	250 – 500 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	n / a
Soils:	Surface observation (reliability low)
Soil Colour:	Red / brown
Soil Texture:	Sandy clay
Geology:	Inferred (reliability high)
Rock / Sediment Type:	Unconsolidated fine grained alluvial sediments

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	BB31
Date / Time:	15 / 04 / 2010; 0830

Appendix 4 – Complete Flora Species List

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Abutilon otocarpum		-	-	1
Abutilon oxycarpum		-	-	1
Acacia angusta		-	-	1
Acacia bancroftiorum		-	-	1
Acacia cambagei	Gidgee	-	-	1
Acacia catenulata	Bendee	-	-	1
Acacia complanata	Flatstem Wattle	-	-	1,3
Acacia coriacea subsp. *sericophylla*		-	-	1
Acacia crassa subsp. *crassa*		-	-	1
Acacia decora	Pretty Wattle	-	-	1,2
Acacia dietrichiana		-	-	1
Acacia elachantha		-	-	1
Acacia excelsa		-	-	1
Acacia farnesiana	Mimosa Bush	-	-	1
Acacia gnidium		-	-	1
Acacia harpophylla	Brigalow	-	-	1,2,3
Acacia hyaloneura		-	-	1
Acacia johnsonii		-	-	1
Acacia julifera subsp. *curvinervia*		-	-	1
Acacia juncifolia		-	-	2
Acacia juniperinum		-	-	2
Acacia leichhardtii		-	-	1
Acacia leiocalyx		-	-	1
Acacia leiocalyx subsp. *leiocalyx*		-	-	1
Acacia leptostachya	Townsville Wattle	-	-	1
Acacia longispicata		-	-	1
Acacia macradenia	Zig-zag Wattle	-	-	1
Acacia melleodora		-	-	1
Acacia multisiliqua		-	-	1
Acacia oswaldii	Miljee	-	-	1
Acacia pendula	Myall	-	-	1
Acacia platycarpa		-	-	1
Acacia polifolia		-	-	1
Acacia salicina	Doolan	-	-	1,3
Acacia salicina		-	-	2
Acacia sericophylla		-	-	1
Acacia shirleyi	Lancewood	-	-	1,2
Acacia sp.		-	-	2
Acacia sp. (Comet L.Pedley 4091)		-	-	1
Acacia sp. (Jericho G.R.Beeston 1065C)		-	-	1
Acacia spania		NT	-	1

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Acacia stipuligera		-	-	1
Acalypha eremorum	Soft Acalypha	-	-	1
Achyranthes aspera		-	-	1
Acrachne racemosa		-	-	1
Aeschynomene indica	Budda Pea	-	-	1
Ajuga australis		-	-	2
Alectryon oleifolius		-	-	1,2
Alloteropsis semialata	Cockatoo Grass	-	-	1
Alphitonia excelsa	Soap Tree	-	-	1,3
Alphitonia excelsa		-	-	2
Alstonia constricta	Bitterbark	-	-	1,2,3
Ammannia multiflora	Jerry-jerry	-	-	1
Amphipogon sericeus		-	-	1
Amyema congener		-	-	1
Amyema conspicua subsp. *conspicua*	Red Lancewood	-	-	1
Amyema quandang		-	-	1
Amyema quandang var. *bancroftii*	Broad-leaved Grey Mistletoe	-	-	1
Ancistrachne uncinulata	Hooky Grass	-	-	1,3
Anthobolus leptomerioides		-	-	1
Aphyllodium biarticulatum		-	-	1
Apophyllum anomalum	Broom Bush	-	-	1,2
Archidendropsis basaltica	Red Lancewood	-	-	1,3
Archidendropsis basaltica		-	-	2
Arctotheca calendula	Cape Weed	-	-	1
Aristida acuta		-	-	1
Aristida calycina		-	-	1,3
Aristida calycina var. *calycina*		-	-	1
Aristida caput-medusae		-	-	1
Aristida holathera var. holathera		-	-	1
Aristida ingrata		-	-	1
Aristida jerichoensis		-	-	1
Aristida jerichoensis var. *subspinulifera*		-	-	1
Aristida lignosa		-	-	1
Aristida personata		-	-	1,3
Aristida pruinosa		-	-	1
Aristida queenslandica var. *queenslandica*		-	-	1
Aristida ramosa	Purple Wiregrass	-	-	1
Aristida spp.		-	-	2
Arundinella nepalensis	Reedgrass	-	-	1
Astrotricha pterocarpa		-	-	1
Atalaya hemiglauca		-	-	1,2,3
Babingtonia densifolia		-	-	1

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Bergia trimera		-	-	1
Beyeria viscosa		-	-	1
Boerhavia dominii		-	-	1
Boerhavia pubescens		-	-	1
Bonamia media		-	-	1
Bonamia media var. *media*		-	-	1
Boronia bipinnata	Rock Boronia	-	-	1
Boronia occidentalis		-	-	1
Boronia odorata		-	-	1
Boronia rosmarinifolia	Forest Boronia	-	-	1
Boronia yarrowmerensis		-	-	1
Bothriochloa bladhii		-	-	1
Bothriochloa decipiens		-	-	1
Bothriochloa ewartiana	Desert Bluegrass	-	-	1,3
Brachychiton australis		-	-	2
Brachychiton populneus		-	-	2
Brachychiton populneus subsp. *trilobus*		-	-	1,3
Breynia oblongifolia		-	-	1,3
Brunoniella australis	Blue Trumpet	-	-	1
Buraria spinosa		-	-	2
Bursaria incana		-	-	1
Callitris glauca		-	-	2
Callitris glaucophylla	White Cypress Pine	-	-	1,3
Calotis cuneifolia	Burr Daisy	-	-	1,2,3
Calotis xanthosioidea		-	-	1
Calytrix microcoma		-	-	1
Calytrix tetragona	Fringe Myrtle	-	-	1
Camptacra barbata		-	-	1
Capparis arborea	Brush Caper Berry	-	-	1
Capparis canescens		-	-	1
Capparis lasiantha	Nipan	-	-	1,2,3
Capparis loranthifolia		-	-	1
Capparis mitchellii		-	-	1
Carissa lanceolata		-	-	1,2,3
Carissa ovata	Currantbush	-	-	1,3
Carissa ovata		-	-	2
Cassinia laevis		-	-	1
Cassytha pubescens	Downy Devil's Twine	-	-	1,3
Centipeda minima subsp. *minima*		-	-	1
Chamaesyce drummondii	Caustic-weed	-	-	1
Cheilanthes distans	Bristly Cloak Fern	-	-	1
Cheilanthes sieberi		-	-	1,3
Cheilanthes sieberi subsp. *sieberi*		-	-	1
Chenopodium carinatum	Green Crumbweed	-	-	1
Chloanthes parviflora		-	-	1,3

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Chloris divaricata var. *divaricata*	Slender Chloris	-	-	1
Chloris sp.		-	-	2
Chloris truncata		-	-	1
Chrysocephalum apiculatum	Yellow Buttons	-	-	1,2
Chrysopogon fallax		-	-	1,2,3
Citrus glauca		-	-	1
Cleistochloa subjuncea		-	-	1
Comesperma pallidum		-	-	1
Commelina diffusa		-	-	2
Convolvulus angustissimus subsp. *angustissimus*	Dawson Gum	-	-	1
Convolvulus arvensis		-	-	1
Coronidium glutinosum		-	-	1
Corymbia brachycarpa		-	-	1
Corymbia citriodora	Spotted Gum	-	-	1
Corymbia citriodora subsp. *citriodora*		-	-	1
Corymbia clarksoniana		-	-	1,2
Corymbia dallachiana		-	-	1,2
Corymbia erythrophloia	Variable-Barked Bloodwood	-	-	1
Corymbia lamprophylla		-	-	1
Corymbia leichhardtii	Rustyjacket	-	-	1,2
Corymbia papuana	Ghost Gum	-	-	1
Corymbia plena		-	-	1,3
Corymbia setosa		-	-	1
Corymbia tesselaris		-	-	1,2
Corymbia trachyphloia subsp. *trachyphloia*		-	-	1
Crinum flaccidum	Murray Lily	-	-	1,2,3
Crotalaria brevis		-	-	1
Cymbidium canaliculatum		-	-	1,3
Cymbopogon ambiguus	Lemon Grass	-	-	1
Cymbopogon bombycinus	Silky Oilgrass	-	-	1
Cymbopogon obtectus		-	-	1
Cymbopogon refractus	Barbed-wire Grass	-	-	1
Cyperus dactylotes		-	-	1
Cyperus exaltatus	Tall Flatsedge	-	-	1,3
Cyperus rotundus	Nutgrass	-	-	1
Cyperus sp.		-	-	2
Dactyloctenium australe		-	-	2
Dactyloctenium radulans	Button Grass	-	-	1
Dampiera discolor		-	-	1
Daviesia filipes		-	-	1,3
Denhamia oleaster		-	-	1
Desmodium brachypodum	Large Ticktrefoil	-	-	1

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Desmodium filiforme		-	-	1
Desmodium macrocarpum	Large-podded Tick-trefoil	NT	-	1,2,3
Desmodium varians	Slender Tick Trefoil	-	-	1
Dianella longifolia var. *stupata*		-	-	1
Digitaria ammophila	Silky Umbrella Grass	-	-	1
Digitaria bicornis		-	-	1
Digitaria brownii		-	-	1,3
Digitaria longiflora		-	-	1
Digitaria ramularis		-	-	1
Dipteracanthus australasicus		-	-	1
Dodonaea filifolia		-	-	1
Dodonaea peduncularis		-	-	1
Dodonaea stenophylla		-	-	1,3
Dodonaea viscosa subsp. *angustissima*	Hairy Indigo	-	-	1
Dodonaea viscosa subsp. *cuneata*		-	-	1
Dodonaea viscosa subsp. *spatulata*		-	-	1
Dysphania melanocarpa forma melanocarpa		-	-	1
Ehretia membranifolia	Weeping Koda	-	-	1
Einadia hastata		-	-	1,3
Einadia nutans		-	-	1
Einadia nutans subsp. *linifolia*		-	-	1
Enchylaena tomentosa		-	-	1,2,3
Enneapogon acicularis		-	-	2
Enneapogon lindleyanus		-	-	1
Enneapogon polyphyllus	Leafy Nineawn	-	-	1,3
Enneapogon robustissimus		-	-	1
Enneapogon virens		-	-	1
Enteropogon ramosus		-	-	1
Eragrostis elongata		-	-	1
Eragrostis lacunaria	Purple Lovegrass	-	-	1,3
Eragrostis lanicaulis		-	-	1
Eragrostis parviflora	Weeping Lovegrass	-	-	1
Eragrostis sororia		-	-	1
Eragrostis sp.		-	-	2
Eragrostis spartinoides		-	-	1
Eragrostis speciosa		-	-	1
Eremophila deserti		-	-	1,3
Eremophila latrobei subsp. *glabra*		-	-	1
Eremophila latrobei subsp. *latrobei*		-	-	1
Eremophila longifolia	Berrigan	-	-	1
Eremophila mitchellii		-	-	1,2,3
Eriachne aristidea		-	-	1

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Eriachne mucronata		-	-	1,3
Erythoxylon australe		-	-	2
Erythoxylum australe		-	-	2
Erythrina vespertilio		-	-	1
Erythroxylum australe	Cocaine Tree	-	-	1
Eucalyptus ammophila	Sandplain Red Gum	-	-	1
Eucalyptus camaldulensis		-	-	1,2
Eucalyptus cambageana	Dawson Gum	-	-	1,2,3
Eucalyptus cloeziana	Gympie Messmate	-	-	1
Eucalyptus coolabah	Coolabah	-	-	1
Eucalyptus crebra	Narrow-leaved Red Ironbark	-	-	1,2,3
Eucalyptus dallachyana		-	-	2
Eucalyptus decorticans		-	-	1
Eucalyptus drepanophylla		-	-	1
Eucalyptus exserta	Queensland Peppermint	-	-	1,2
Eucalyptus melanophloia		-	-	1,2,3
Eucalyptus populnea	Poplar Box	-	-	1,2,3
Eucalyptus shirleyi		-	-	1
Eucalyptus similis	Queensland Yellowjacket	-	-	1
Eucalyptus thozetiana		-	-	1,2
Eucalyptus whitei	White's Ironbark	-	-	1
Eucalyptus xanthoclada	Yellow-branched Ironbark	-	-	1
Eulalia aurea	Silky Browntop	-	-	1,2
Everistia vacciniifolia		-	-	1
Everistia vacciniifolia var. *nervosa*		-	-	1
Evolvulus alsinoides		-	-	1,3
Evolvulus alsinoides var. *villosicalyx*		-	-	1
Exocarpos sparteus	Slender Cherry	-	-	1
Fimbristylis dichotoma	Common Fringe-rush	-	-	1
Flindersia dissosperma		-	-	1
Gahnia aspera		-	-	1
Geijera parviflora	Wilga	-	-	1,2,3
Glossostigma diandrum		-	-	1
Glycine clandestina		-	-	1
Glycine tabacina	Glycine Pea	-	-	1
Glycine tomentella	Woolly Glycine	-	-	1
Gompholobium foliolosum	Fern-leaved Burtonia	-	-	1
Gomphrena celosioides	Gomphrena Weed	-	-	1,3
Goodenia glabra		-	-	1
Goodenia goodeniacea		-	-	1
Goodenia hirsuta		-	-	1,3
Goodenia viridula		-	-	1
Grevillea decora subsp. *decora*		-	-	1
Grevillea parallela		-	-	1

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Grevillea pteridifolia	Golden Parrot Tree	-	-	1
Grevillea sessilis		-	-	1
Grevillea stenobotrya		-	-	1
Grevillea striata	Beefwood	-	-	1,3
Grevillea striata		-	-	2
Grewia latifolia	Dysentery Plant	-	-	1
Grewia retusifolia		-	-	1,3
Grewia sp.		-	-	2
Hakea chordophylla		-	-	1
Hakea lorea subsp. *lorea*		-	-	1
Helichrysum glutinosum		-	-	1
Heliotropium cunninghamii		-	-	1
Heliotropium moorei		-	-	1
Heliotropium tanythrix		-	-	1
Heteropogon contortus	Black Speargrass	-	-	1,2,3
Hibiscus sturtii		-	-	1
Homoranthus thomasii		-	-	1
Hovea lanceolata		-	-	1
Hovea parvicalyx		-	-	1
Hovea tholiformis		-	-	1
Hybanthus monopetalus		-	-	2
Hybanthus stellarioides		-	-	1
Hymenachne amplexicaulis		-	-	2
Indigofera australis		-	-	1,3
Indigofera colutea	Sticky Indigo	-	-	1
Indigofera hirsuta	Hairy Indigo	-	-	1
Ipomoea polymorpha		-	-	1
Iseilema fragile	Flinders Grass			3
Jacksonia ramosissima		-	-	1
Jacksonia rhadinoclona	Miles Dogwood	-	-	1
Jasminum didymum		-	-	1,2
Keraudrenia collina		-	-	1
Labichea rupestris		-	-	1
Leptochloa decipiens subsp. *decipiens*		-	-	1
Leptochloa digitata		-	-	1
Leptosema chapmanii		-	-	1
Leptospermum		-	-	1
Leptospermum lamellatum		-	-	1
Leptospermum sericatum		-	-	1
Lithomyrtus microphylla		-	-	1
Lomandra confertifolia subsp. *pallida*		-	-	1,3
Lomandra leucocephala		-	-	1
Lomandra leucocephala		-	-	2
Lomandra leucocephala subsp.		-	-	1

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
leucocephala				
Lomandra multiflora subsp. *multiflora*		-	-	1
Lysiana spathulata subsp. *spathulata*		-	-	1
Lysiana subfalcata		-	-	1
Lysicarpus angustifolius	Budgeroo	-	-	1,3
Lysicarpus angustifolius		-	-	2
Lysiphyllum		-	-	1
Lysiphyllum carronii	Ebony Tree	-	-	1,2
Lysiphyllum hookeri	Queensland Ebony	-	-	1
Maireana microphylla		-	-	1
Maireana villosa		-	-	1
Malvastrum americanum var. *americanum*		-	-	1
Marsdenia viridiflora		-	-	1,3
Marsdenia viridiflora subsp. *viridiflora*		-	-	1
Marsilea mutica	Shiny Nardoo	-	-	1
Maytenus cunninghamii	Yellow Berry Bush	-	-	1,3
Melaleuca bracteata		-	-	1
Melaleuca linariifolia	Snow-In Summer	-	-	1
Melaleuca nervosa		-	-	1
Melaleuca pallescens		-	-	1
Melaleuca tamariscina		-	-	1
Melaleuca uncinata		-	-	1
Melaleuca viminalis		-	-	2
Melhania oblongifolia		-	-	1
Melinis repens	Red Natal Grass	-	-	1,2,3
Microcorys queenslandica		-	-	1
Micromyrtus gracilis		-	-	1
Micromyrtus rotundifolia		V	-	1
Mirbelia aotoides		-	-	1
Monochoria cyanea		-	-	2
Muehlenbeckia florulenta	Lignum	-	-	1
Murdannia graminea		-	-	2
Myoporum acuminatum	Coastal Boobialla			2,3
Myoporum montanum	Boobialla	-	-	1
Neptunia gracilis Native	Native Sensitive Plant			3
Ochrosperma adpressum		-	-	1
Olearia xerophila		-	-	1
Opuntia stricta		-	-	1
Opuntia tomentosa	Velvety Tree Pear	-	-	1,2,3
Owenia acidula	Emu Apple	-	-	1,3
Oxalis radicosa		-	-	1
Pandorea pandorana		-	-	1,3

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Panicum effusum		-	-	1,3
Panicum larcomianum		-	-	1
Parkinsonia aculeata	Jerusalem Thorn	-	-	1
Parsonsia eucalyptophylla	Gargaloo	-	-	1
Parsonsia lanceolata	Northern Silkpod	-	-	1
Parsonsia sp.		-	-	2
Parsonsia straminea	Monkey Rope	-	-	1
Paspalidium caespitosum	Brigalow Grass	-	-	1
Paspalidium constrictum		-	-	1
Paspalidium gracile	Slender Panic	-	-	1
Paspalidium rarum		-	-	1
Pennisetum ciliare		-	-	1,2,3
Peripleura obovata		-	-	1
Perotis rara		-	-	1,2
Persicaria attenuata	Slender Knotweed			3
Persicaria orientalis	Princes Feathers	-	-	1
Persoonia falcata		-	-	1,2
Petalostigma banksii		-	-	1
Petalostigma pubescens	Quinine Tree	-	-	1,2,3
Petalostylis labicheoides		-	-	1
Phebalium nottii	Pink Phebalium	-	-	1
Phyllanthus		-	-	1
Phyllanthus carpentariae		-	-	1
Phyllanthus fuernrohrii		-	-	1
Phyllanthus maderaspatensis		-	-	1
Phyllanthus maderaspatensis var. *maderaspatensis*		-	-	1
Phyllanthus sp.		-	-	2
Phyllanthus virgatus		-	-	1
Pimelea trichostachya	Flaxweed	-	-	1,3
Platysace valida		-	-	1
Pluchea dentex	Bowl Daisy	-	-	1
Podolepis longipedata		-	-	1
Pogonolobus reticulatus		-	-	1
Polycarpaea corymbosa		-	-	1
Polygala linariifolia		-	-	1
Polymeria pusilla		-	-	1
Portulaca australis		-	-	1
Portulaca oleracea	Pigweed	-	-	1
Portulaca pilosa subsp. *pilosa*		-	-	1
Prostanthera collina		-	-	1
Prostanthera leichhardtii		-	-	2
Pseuderanthemum variabile		-	-	2
Psydrax odorata		-	-	1,2
Psydrax odorata forma buxifolia		-	-	1
Psydrax oleifolia		-	-	1,3

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Psydrax oleifolius		-	-	2
Pterocaulon redolens		-	-	1
Pterocaulon serrulatum		-	-	1
Pterocaulon serrulatum var. *serrulatum*		-	-	1
Pterocaulon sphacelatum	Applebush	-	-	1
Ptilotus polystachyus		-	-	1,3
Rhynchosia minima		-	-	1,3
Ricinocarpos ledifolius	Scrub Wedding Bush	-	-	1
Ricinocarpos linearifolius		-	-	1,3
Ricinocarpos sp. (Blackdown Tableland R.J.Henderson H610)		-	-	1
Rostellularia adscendens		-	-	1,3
Rutidosis leucantha		-	-	1
Salsola kali subsp. *kali*	Soft Roly-poly	-	-	1,3
Santalum lanceolatum		-	-	1,3
Sarcostemma viminale subsp. *brunonianum*		-	-	1
Sauropus elachophyllus		-	-	1
Sauropus rigens		-	-	1
Scaevola parvifolia subsp. *parvifolia*		-	-	1
Scaevola spinescens	Prickly Fan Flower	-	-	1,2
Schizachyrium fragile	Firegrass	-	-	1
Schoenoplectus laevis		-	-	1
Schoenus kennyi		-	-	1
Scleria brownii		-	-	1,3
Scleria sphacelata		-	-	1
Sclerolaena		-	-	1
Sclerolaena birchii	Galvanised Burr	-	-	1,3
Sclerolaena convexula		-	-	1
Senna artemisioides		-	-	1,3
Senna artemisioides subsp. *filifolia*		-	-	1
Senna artemisioides subsp. *zygophylla*		-	-	1
Senna occidentalis	Arsenic Weed			3
Seringia corollata		-	-	1
Setaria apiculata		-	-	1
Setaria surgens		-	-	1
Sida atherophora		-	-	1
Sida cordifolia	Flannel Weed			3
Sida corrugata		-	-	1,3
Sida filiformis		-	-	1
Sida rohlenae		-	-	1,3
Sida sp.		-	-	2
Sida spinosa	Spiny Sida	-	-	1,3

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Sida subspicata	Spiked Sida	-	-	1,3
Sida virgata		-	-	1
Solanum ellipticum	Potato Bush	-	-	1,3
Solanum ferocissimum		-	-	1
Solanum parvifolium		-	-	1,3
Spartothamnella juncea	Native Broom	-	-	1
Spartothamnella puberula		-	-	1
Spermacoce brachystema		-	-	1
Sporobolus australasicus		-	-	1
Sporobolus caroli	Fairy Grass	-	-	1
Sporobolus sp.		-	-	2
Stylidium eglandulosum		-	-	1
Stylidium eriorhizum		-	-	1
Styloanthes scabra		-	-	2
Terminalia canescens	Native Almond			3
Terminalia oblongata		-	-	1
Themeda avenacea		-	-	1
Themeda quadrivalvis	Grader Grass			3
Themeda triandra	Kangaroo Grass	-	-	1,2,3
Thryptomene parviflora		-	-	1
Thymophylla tenuiloba		-	-	1
Thyridolepis xerophila		-	-	1
Trema tomentosa		-	-	2
Tribulopis angustifolia		-	-	1
Tribulus eichlerianus	Bull Head	-	-	1
Tricoryne elatior	Yellow Autumn Lily	-	-	1
Triodia mitchellii	Buck Spinifex	-	-	1
Triodia pungens		-	-	1,2,3
Tripogon loliiformis	Five Minute Grass	-	-	1
Triraphis mollis	Purple Plumegrass	-	-	1
Uraria lagopodioides		-	-	1
Urochloa piligera		-	-	1
Urochloa subquadripara		-	-	1
Ventilago viminalis	Supplejack	-	-	1,2,3
Verbena aristigera	Mayne's Pest			3
Verbena halei		-	-	1
Verbesina encelioides	Crownbeard	-	-	1,3
Vittadinia pustulata		-	-	1
Vittadinia sulcata	Native Daisy	-	-	1
Wahlenbergia gracilis	Australian Bluebell	-	-	2,3
Waltheria indica		-	-	1,3
Xanthorrhoea johnsonii		-	-	1
Ximenia americana		-	-	1

*Source: 1, Desktop searches; 2, Unidel Survey; 3, Previous studies

Appendix 5 – Fauna Habitat Values

Habitat	Woodland (BimbleBox Nature Refuge)		Woodland (Cavendish area)		Riverine (Lagoon Creek)		Modified Pasture Land	
Site	**FF01**	**FF02**	**FF03**	**FF04**	**FF05**	**FF06**	**FF07**	**FF08**
Landform	Flat-plain	Flat-plain	Flat-plain	Flat-plain	Creekline-riverine	Creekline-riverine	hill mid slope	hill upper slope
Vegetation Description	woodland	woodland	woodland	woodland	woodland	Woodland	grassland	grassland
Understorey	Shrubs-Grasses	Shrubs-Grasses	Shrubs-Grasses	Shrubs-Grasses	Grasses	Grasses	Grasses	Grasses
Leaf Litter % Cover	70	45	30	20	40	10	0	0
Weed Cover	< 5%	< 5%	< 5%	< 5%	< 5%	60%	> 95%	> 95%
Distance Water	>2 km	>2 km	>2 km	>2 km	151-500 m	51-150 m	>2 km	>2 km
Distance Riparian	>2 km	>2 km	>2 km	>2 km	51-150 m	51-150 m	>2 km	>2 km
Weather Conditions	Wet / Warm	Wet / Warm	Wet / Warm	Wet / Warm	Wet / Cool	Wet / Cool	Wet / Cool	Wet / Cool
Ground Logs / 50 m plot	2	1	2	1	3	3	0	0
Fire Evidence	No	No	No	No	>3 years ago	>3 years ago	No	No
Habitat Condition 1-10	8	8	8	8	7	5	3	3
Rocky Substrate	No rocks	No rocks	No rocks	No rocks	No rocks	No rocks	No rocks	No rocks
Soil Type	Loamy clay	Loamy clay	Loamy clay	Sandy Loam	Loamy clay	Sandy Loam	Loam	Loamy clay
Tree Hollows per 50 m plot	10	9	13	12	15	10	0	0

Appendix 6 – Regionally Significant Fauna Species of the Desert Uplands Bioregion Potentially Occurring Within the Broader Mine Site Area

Freshwater fish

Craterocephalus sp.	Myross Hardyhead
Hypseleotris sp. A	Lake's Carp Gudgeon
Hypseleotris sp. B	Midgley's Carp Gudgeon
Neosilurus mollespiculum	Soft-spined Catfish
Neosilurus sp. D	Bulloo Falsespined Catfish
Scortum hilli	Leathery Grunter

Frogs

Pseudophryne major	Great Brown Broodfrog
Uperoleia lithomoda	Stonemason Gungan

Reptiles

Anomalopus gowi	Skink
Ctenotus rosarius	Skink
Diplodactylus vittatus	Wood Gecko
Diporiphora winneckei	Winnecke's Dragon
Egernia stokesii	Gidgee Skink
Lerista sp. '	Desert Uplands' skink
Suta spectabilis dwyeri	Blackheaded / Dwyer's Snake
Tiliqua multifasciata	Centralian Blue-tongued Lizard
Tympanocryptis cephalus	Gunther's Earless Dragon
Varanus mertensi	Merten's Water Monitor

Birds

Acanthiza pusilla	Brown Thornbill
Ardeotis australis	Australian Bustard
Burhinus grallarius	Bush Stonecurlew
Climacteris picumnus	Brown Treecreeper
Emblema pictum	Painted Finch
Eremiornis carteri	Spinifex Bird
Falco subniger	Black Falcon
Lichenostomus leucotis	White-eared Honeyeater
Melanodryas cucullata	Hooded Robin
Pomatostomus temporalis	Grey-crowned Babbler
Pyrrholaemus sagittatus	Speckled Warbler
Tyto novaehollandiae	Masked Owl

Mammals

Aepyprymnus rufescens	Rufous Bettong
Lagorchestes conspicillatus	Spectacled Hare-wallaby
Leggadina lakedownensis	Lakeland Downs Mouse
Nyctophilus gouldi	Gould's Long-eared Bat
Petauroides volans	Greater Glider
Petaurus norfolcensis	Squirrel Glider
Phascolarctos cinereus	Koala
Planigale maculata	Common Planigale
Pseudomys desertor	Desert Mouse
Pseudomys patrius	Queensland Pebble-mound Mouse
Sminthopsis murina	Common Dunnart

Trichosurus vulpecula	Common Brushtail Possum
Vespadelus baverstocki	Inland Forest Bat
Vespadelus finlaysoni	Inland Cave Bat
Wallabia bicolor	Swamp Wallaby
Zyzomys argurus	Common Rockrat

Appendix 7 – Complete Fauna Species List

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Amphibian				
Cyclorana alboguttata	Greenstripe Frog	-	-	1
Cyclorana brevipes	Superb Collared Frog	-	-	1
Cyclorana novaehollandiae	Eastern Snapping Frog	-	-	1
Limnodynastes peronii	Striped Marshfrog	-	-	1
Limnodynastes terraereginae	Scarlet Sided Pobblebonk	-	-	1
Litoria caerulea	Common Green Treefrog	-	-	1,2,3
Litoria inermis	Bumpy Rocketfrog	-	-	1,3
Litoria rubella	Ruddy Treefrog	-	-	1,2
Neobatrachus sp.	n / a	-	-	1
Neobatrachus sudelli	Meeowing Frog	-	-	1
Notaden bennettii	Holy Cross Frog	-	-	1
Opisthodon ornatus	Ornate Burrowing Frog	-	-	1,2,3
Pseudophryne major	Great Brown Broodfrog	-	-	2
Rhinella marina	Cane Toad	-	-	1,2,3
Uperoleia rugosa	Chubby Gungan	-	-	1
Reptile				
Amphibolurus gilberti	Gilbert's Dragon	-	-	2
Amphibolurus nobbi	Nobbi	-	-	1,2
Aspidites melanocephalus	Black-headed Python	-	-	2
Boiga irregularis	Brown Tree Snake	-	-	1
Carlia munda	n / a	-	-	1
Cryptoblepharus pannosus	Ragged Snake-eyed Skink	-	-	1,2
Cryptoblepharus virgatus sensu lato	n / a	-	-	1
Ctenophorus nuchalis	Central Netted Dragon	-	-	1,3
Ctenotus leonhardii	n / a	-	-	1,2
Ctenotus pantherinus	n / a	-	-	1,2
Ctenotus robustus	n / a	-	-	1,2
Demansia psammophis	Yellow-faced Whip Snake	-	-	1
Diplodactylus conspicillatus	Fat-tailed Diplodactylus	-	-	1,2
Diporiphora australis	n / a	-	-	1,2
Eremiascincus fasciolatus	Narrow-banded Sand Swimmer	-	-	1
Eremiascincus richardsonii	Broad-banded Sand Swimmer	-	-	1
Furina dunmalli	Dunmall's Snake	V	V	1
Furina ornata	Orange-naped Snake	-	-	1
Gehyra catenata	n / a	-	-	1,2
Heteronotia binoei	Bynoe's Gecko	-	-	1,2,3
Hoplocephalus bitorquatus	Pale-Headed Snake	-	-	1
Lerista fragilis	n / a	-	-	1
Lialis burtonis	Burton's Legless Lizard	-	-	2
Lucasium steindachneri	Steindachner's Gecko	-	-	1,2
Menetia greyii	n / a	-	-	1

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Menetia timlowi	n / a	-	-	1
Morethia boulengeri	n / a	-	-	1
Morethia taeniopleura	Fire-tailed Skink	-	-	1
Nephrurus asper	Spiny Knob-tailed Gecko	-	-	1
Oedura monilis	n / a	-	-	1
Oedura rhombifer	Zig-zag Gecko	-	-	1
Paradelma orientalis	Brigalow Scaly-foot	V	V	1
Pogona barbata	Bearded Dragon	-	-	1
Pygopus lepidopodus	Common Scaly-foot	-	-	1
Ramphotyphlops unguirostris	n / a	-	-	1
Rhinoplocephalus boschmai	Carpentaria Whip Snake	-	-	1
Rhynchoedura ornata	Beaked Gecko	-	-	1,2
Egernia rugosa	Yakka Skink	V	V	1
Simoselaps australis	Coral Snake	-	-	1
Strophurus williamsi	Soft-spined Gecko	-	-	1,2
Suta dwyeri	n / a	-	-	1
Suta suta	Myall Snake	-	-	1
Tiliqua scincoides	Eastern Blue-tongued Lizard	-	-	1
Varanus tristis	Black-tailed Monitor	-	-	1
Bird				
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	-	-	1,2,3
Acanthiza apicalis	Inland Thornbill	-	-	1,2
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	-	-	1,2
Acanthiza nana	Yellow Thornbill	-	-	1,2
Acanthiza reguloides	Buff-rumped Thornbill	-	-	1,3
Acanthiza uropygialis	Chestnut-rumped Thornbill	-	-	1
Accipiter fasciatus	Brown Goshawk	-	-	1,2
Aegotheles cristatus	Australian Owlet-nightjar	-	-	1
Anas gracilis	Grey Teal	-	-	1,2
Anas superciliosa	Pacific Black Duck	-	-	1,2
Anhinga novaehollandiae	Australasian Darter	-	-	1,2
Anthus novaeseelandiae	Australasian Pipit	-	-	1,2,3
Aprosmictus erythropterus	Red-Winged Parrot	-	-	1,2,3
Apus pacificus	Fork-tailed Swift	-	Mi	1
Aquila audax	Wedge-tailed Eagle	-	-	1,2,3
Ardea alba	Great Egret	-	Mi	1
Ardea ibis	Cattle Egret	-	Mi	1
Ardea intermedia	Intermediate Egret	-	-	2
Ardea modesta	Eastern Great Egret	-	-	1
Ardea pacifica	White-necked Heron	-	-	1,2
Ardeotis australis	Australian Bustard	-	-	1,2
Artamus cinereus	Black-faced Woodswallow	-	-	1,2
Artamus cyanopterus	Dusky Woodswallow	-	-	1,2
Artamus minor	Little Woodswallow	-	-	1,2
Artamus personatus	Masked Woodswallow	-	-	1,2,3

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Artamus superciliosus	White-rowed Woodswallow	-	-	1,3
Aviceda subcristata	Pacific Baza	-	-	1
Aythya australis	Hardhead	-	-	1,2
Burhinus grallarius	Bush Stone-curlew	-	-	1,2,3
Cacatua galerita	Sulphur-Crested Cockatoo	-	-	1,2,3
Cacomantis pallidus	Pallid Cuckoo	-	-	1
Cacomantis variolosus	Brush Cuckoo	-	-	1
Calyptorhynchus banksii	Red-tailed Black-cockatoo	-	-	2
Centropus phasianinus	Pheasant Coucal	-	-	1,2
Chalcites basalis	Horsfield's Bronze-cuckoo	-	-	1
Chalcites lucidus	Shining Bronze-cuckoo	-	-	1
Chalcites osculans	Black-eared Cuckoo	-	-	1
Chenonetta jubata	Australian Wood Duck	-	-	1,2,3
Cheramoeca leucosterna	White-Backed Swallow	-	-	1
Chthonicola sagittata	Speckled Warbler	-	-	1
Cincloramphus cruralis	Brown Songlark	-	-	1,2
Climacteris picumnus	Brown Treecreeper	-	-	1,2,3
Colluricincla harmonica	Grey Shrike-thrush	-	-	1,2
Coracina maxima	Ground Cuckoo-shrike	-	-	1
Coracina novaehollandiae	Black-faced Cuckoo-shrike	-	-	1,2,3
Coracina papuensis	White-bellied Cuckoo-shrike	-	-	1
Coracina tenuirostris	Cicadabird	-	-	1
Corcorax melanorhamphos	White-winged Chough	-	-	1
Corvus bennetti	Little Crow	-	-	1
Corvus coronoides	Australian Raven	-	-	1,3
Corvus orru	Torresian Crow	-	-	1,2,3
Coturnix ypsilophora	Brown Quail	-	-	1
Cracticus nigrogularis	Pied Butcherbird	-	-	1,2,3
Cracticus tibicen	Australian Magpie	-	-	1,2,3
Cracticus torquatus	Grey Butcherbird	-	-	1,2
Cygnus atratus	Black Swan	-	-	1
Dacelo leachii	Blue-winged Kookaburra	-	-	1,3
Dacelo novaeguineae	Laughing Kookaburra	-	-	1,2,3
Daphoenositta chrysoptera	Varied Sittella	-	-	1,3
Dendrocygna eytoni	Plumed Whistling-duck	-	-	1,3
Dicaeum hirundinaceum	Mistletoebird	-	-	1,3
Dromaius novaehollandiae	Emu	-	-	1,2,3
Egretta novaehollandiae	White-faced Heron	-	-	2,3
Elanus axillaris	Black-shouldered Kite	-	-	1,2
Elseyornis melanops	Black-fronted Dotterel	-	-	1,2
Entomyzon cyanotis	Blue-faced Honeyeater	-	-	1,3
Eolophus roseicapillus	Galah	-	-	1,2,3
Ephippiorhynchus asiaticus	Black-necked Stork	-	-	2
Epthianura tricolor	Crimson Chat	-	-	1
Erythrogonys cinctus	Red-Kneed Dotterel	-	-	2

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Eudynamys orientalis	Eastern Koel	-	-	1
Eurostopodus argus	Spotted Nightjar	-	-	1
Eurystomus orientalis	Dollarbird	-	-	1,2
Falco berigora	Brown Falcon	-	-	1,2,3
Falco cenchroides	Nankeen Kestrel	-	-	1,3
Falco peregrinus	Peregrine Falcon	-	-	1,3
Fulica atra	Eurasian Coot	-	-	1
Gallinago hardwickii	Latham's Snipe	-	Mi	1
Geopelia cuneata	Diamond Dove	-	-	1,2
Geopelia humeralis	Bar-shouldered Dove	-	-	1,2,3
Geopelia placida	Peaceful Dove	-	-	1,3
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	1
Gerygone albogularis	White-throated Gerygone	-	-	1,2
Gerygone fusca	Western Gerygone	-	-	1,3
Grallina cyanoleuca	Magpie-lark	-	-	1,2,3
Grus rubicunda	Brolga	-	-	1,2
Haliaeetus leucogaster	White-bellied Sea-eagle	-	Mi	1
Haliastur sphenurus	Whistling Kite	-	-	1,2
Henostomus chrysops	Yellow-faced Honeyeater	-	-	3
Hieraaetus morphnoides	Little Eagle	-	-	1
Himantopus himantopus	Black-winged Stilt	-	-	1
Hirundapus caudacutus	White-throated Needletail	-	Mi	1
Lalage sueurii	White-winged Triller	-	-	1,2
Lichenostomus keartlandi	Grey-headed Honeyeater	-	-	2
Lichenostomus penicillatus	White-plumed Honeyeater	-	-	1,2
Lichenostomus plumulus	Grey-fronted Honeyeater	-	-	1
Lichenostomus virescens	Singing Honeyeater	-	-	1,2,3
Lichmera indistincta	Brown Honeyeater	-	-	1
Lophochroa leadbeateri	Major Mitchell's Cockatoo	V	-	1
Malurus lamberti	Variegated Fairy-wren	-	-	1,3
Malurus leucopterus	White-winged Fairy-wren	-	-	1
Malurus melanocephalus	Red-Backed Fairy-wren	-	-	1,2
Manorina flavigula	Yellow-throated Miner	-	-	1,2
Manorina melanocephala	Noisy Miner	-	-	1,3
Melanodryas cucullata	Hooded Robin	-	-	1,2
Melithreptus albogularis	White-throated Honeyeater	-	-	1
Melithreptus brevirostris	Brown-headed Honeyeater	-	-	1
Melithreptus gularis	Black-chinned Honeyeater	NT	-	1
Melopsittacus undulatus	Budgerigar			1
Merops ornatus	Rainbow Bee-eater	-	Mi	1,2
Microcarbo melanoleucos	Little Pied Cormorant	-	-	1,2
Microeca fascinans	Jacky Winter	-	-	1,2,3
Milvus migrans	Black Kite	-	-	1,2
Mirafra javanica	Horsfield's Bushlark	-	-	1
Myiagra inquieta	Restless Flycatcher	-	-	1,2,3

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Myiagra rubecula	Leaden Flycatcher	-	-	1
Neochmia modesta	Plum-headed Finch	-	-	1
Neochmia ruficauda ruficauda	Star Finch (eastern)	E	E	1
Ninox boobook	Southern Boobook	-	-	1
Ninox connivens	Barking Owl	-	-	1
Ninox novaeseelandiae	Southern Boobook	-	-	2
Northiella haematogaster	Blue Bonnet	-	-	1
Numenius minutus	Little Curlew	-	Mi	1
Nycticorax caledonicus	Nankeen Night-heron	-	-	1
Nymphicus hollandicus	Cockatiel	-	-	1
Ocyphaps lophotes	Crested Pigeon	-	-	1,2,3
Oreoica gutturalis	Crested Bellbird	-	-	1,2
Oriolus sagittatus	Olive-backed Oriole	-	-	1
Pachycephala rufiventris	Rufous Whistler	-	-	1,2
Pardalotus rubricatus	Red-Browed Pardalote	-	-	1
Pardalotus striatus	Striated Pardalote	-	-	1,2,3
Passer domesticus	House Sparrow	-	-	1
Pelecanus conspicillatus	Australian Pelican	-	-	2
Petrochelidon ariel	Fairy Martin	-	-	1,3
Petrochelidon nigricans	Tree Martin	-	-	1
Petroica goodenovii	Red-capped Robin	-	-	1
Phalacrocorax carbo	Great Cormorant	-	-	2
Phalacrocorax sulcirostris	Little Black Cormorant	-	-	1
Phalacrocorax varius	Pied Cormorant	-	-	1,2
Phaps chalcoptera	Common Bronzewing	-	-	1,2,3
Philemon citreogularis	Little Friarbird	-	-	1,2
Philemon corniculatus	Noisy Friarbird	-	-	1,2
Platycercus adscitus	Pale-headed Rosella	-	-	1,2,3
Plectorhyncha lanceolata	Striped Honeyeater	-	-	1,2,3
Podargus strigoides	Tawny Frogmouth	-	-	1,2
Podiceps cristatus	Great Crested Grebe	-	-	2
Poephila cincta cincta	Black-throated Finch (southern)	E	E	1
Pomatostomus temporalis	Grey-crowned Babbler	-	-	1,2,3
Ptilonorhynchus maculatus	Spotted Bowerbird	-	-	1,3
Rhipidura albiscapa	Grey Fantail	-	-	1,3
Rhipidura leucophrys	Willie Wagtail	-	-	1,2,3
Rostratula australis	Australian Painted Snipe	V	V / Mi	1
Scythrops novaehollandiae	Channel-Billed Cuckoo	-	-	1
Smicrornis brevirostris	Weebill	-	-	1,3
Sphecotheres vieilloti	Australasian Figbird	-	-	1
Strepera graculina	Pied Currawong	-	-	1,2
Struthidea cinerea	Apostlebird	-	-	1,2,3
Tachybaptus novaehollandiae	Australasian Grebe	-	-	1
Taeniopygia bichenovii	Double-barred Finch	-	-	1,2,3
Taeniopygia guttata	Zebra Finch	-	-	1,2,3

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Threskiornis spinicollis	Straw-necked Ibis	-	-	1
Todiramphus macleayii	Forest Kingfisher	-	-	1
Todiramphus pyrrhopygius	Red-backed Kingfisher	-	-	1,2,3
Todiramphus sanctus	Sacred Kingfisher	-	-	1
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	-	-	2
Trichoglossus haematodus	Rainbow Lorikeet	-	-	1,2,3
Turnix pyrrhothorax	Red-chested Button-quail	-	-	1
Turnix velox	Little Button-quail	-	-	1
Tyto javanica	Barn Owl	-	-	1,2
Vanellus miles	Masked Lapwing	-	-	1,2
Vanellus tricolor	Banded Lapwing	-	-	1,2
Zosterops lateralis	Silvereye	-	-	1
Mammal				
Aepyprymnus rufescens	Rufous Bettong	-	-	2,3
Bos taurus	European Cattle	-	-	1,3
Canis familiaris	Dog	-	-	1
Canis lupus dingo	Dingo	-	-	1
Chaerephon jobensis Northern Freetail-bat	Northern Freetail-Bat	-	-	3
Chalinolobus gouldii	Gould's Wattled Bat	-	-	1,2,3
Chalinolobus morio	Chocolate Wattled Bat	-	-	1,2,3
Chalinolobus picatus	Little Pied Bat	-	-	2
Dasyurus hallucatus	Northern Quoll	-	E	1
Equus caballus	Horse	-	-	1
Felis catus	Cat	-	-	1,2,3
Lagorchestes conspicillatus	Spectacled Hare-wallaby	-	-	1,2
Leggadina forresti	Forrest's Mouse	-	-	1
Macropus giganteus	Eastern Grey Kangaroo	-	-	1,2,3
Macropus robustus	Common Wallaroo	-	-	1,2,3
Macropus rufus	Red Kangaroo	-	-	1,2,3
Mormopterus beccarii	Beccari's Freetail Bat	-	-	3
Mormopterus sp. 3	Inland Freetail Bat	-	-	1,2,3
Mus musculus	House Mouse	-	-	1
Nyctophilus sp.	Northern Long-eared Bat	-	-	2
Oryctolagus cuniculus	Rabbit	-	-	1,2,3
Petaurus breviceps	Sugar Glider	-	-	2
Phascolarctos cinereus	Koala	-	-	1
Pseudomys delicatulus	Delicate Mouse	-	-	1
Pseudomys desertor	Desert Mouse	-	-	1,2
Rattus tunneyi	Pale Field-Rat	-	-	1
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	-	-	1,2
Scotorepens balstoni	Inland Broad-nosed Bat	-	-	1,2,3
Scotorepens greyii	Little Broad-nosed Bat	-	-	1,2,3
Sminthopsis macroura	Stripe-faced Dunnart	-	-	1
Sus scrofa	Pig	-	-	1,2
Tachyglossus aculeatus	Short-beaked Echidna	-	-	1,2

Scientific name	Common Name	Status		*Source
		VM Act	EPBC Act	
Tadarida australis	White-striped Freetail Bat	-	-	1,2
Taphozous troughtoni	Troughton's Sheathtail Bat	-	-	3
Trichosurus vulpecula	Common Brushtail Possum	-	-	1,2
Vespadelus baverstocki	Inland Forest Bat	-	-	3
Vespadelus finlaysoni / V. troughtoni	Inland / Eastern Cave Bat	-	-	3
Vespadelus vulturnus	Little Forest Bat	-	-	1,3
Wallabia bicolor	Swamp Wallaby	-	-	2

*Source: 1, Desktop searches; 2, Unidel Survey; 3, Previous studies

Appendix 8 – Bats Call Analysis

Ultrasonic surveys for bat calls were undertaken in four localities, each for a sampling period of eight hours. Localities are shown in **Figure 2** and the total numbers of bat calls recorded in each site are shown in **Figure 6**.

The system used to record bats provided full spectrum calls and was provided by Binary Acoustic Technology (http://binaryacoustictech.com/index.htm). Call analysis was also conducted using software from this source. It is considered that in some instances, calls can be more reliably identified using the full spectrum recordings than the zero-crossing readouts provided by ANABAT systems.

Nine species were identified using ultrasonic call analysis (**Table 13**). Four of these species were also captured in harp traps during the survey. Examples of the echo-location calls for each species are shown below (**Figures 7a to 7i**).

Table 13. Bat species recorded during the field survey

Species Name	Common Name
Chalinolobus gouldii	Gould's Wattled Bat
Chalinolobus morio	Chocolate Wattled Bat
Chalinolobus picatus	Little Pied Bat
Mormopterus sp. 3	Inland Freetail Bat
Saccolaimus flaviventris	Yellow-Bellied Sheathtail Bat
Scotorepens balstoni	Inland Broad-nosed Bat
Scotorepens greyi	Little Broad-nosed Bat
Tadarida australis	White-striped Freetail Bat
Vespadelus vulturnus	Little Forest Bat

A previous WorleyParsons report (2009) identified *Vespadelus baverstocki* from ultrasonic call analysis; however this species was not identified in this survey. The *Vespadelus* species identified in this survey appears to be *V. vulturnus*. *V. baverstocki* calls usually sweep down to a characteristic frequency of 45 to 47kHz while *V. vulturnus* calls rarely sweep below 50kHz (Pennay *et al*. 2004). A typical *V. vulturnus* call recorded during the survey is shown in **Figure 7a.**

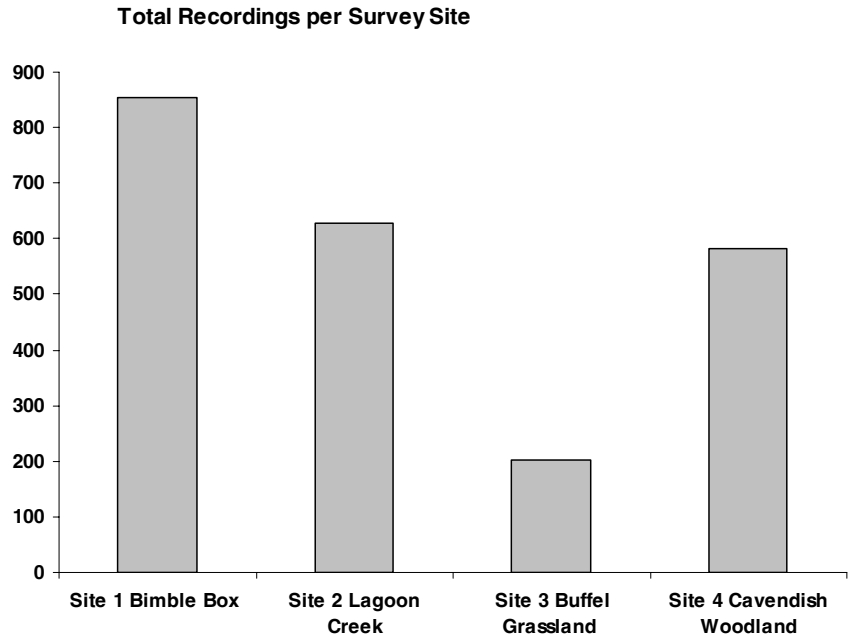

Figure 6. Numbers of bat calls recorded in each site

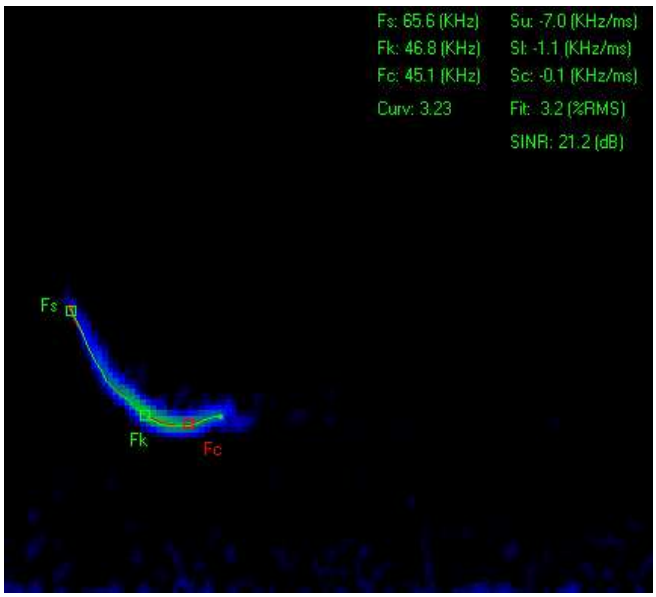

Figure 7a. *Vespadelus vulturnus* call.

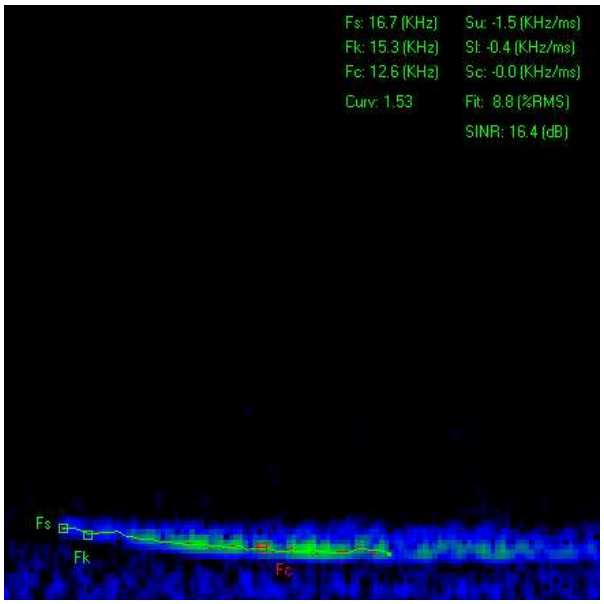

Figure 7b. *Tadarida australis* call.

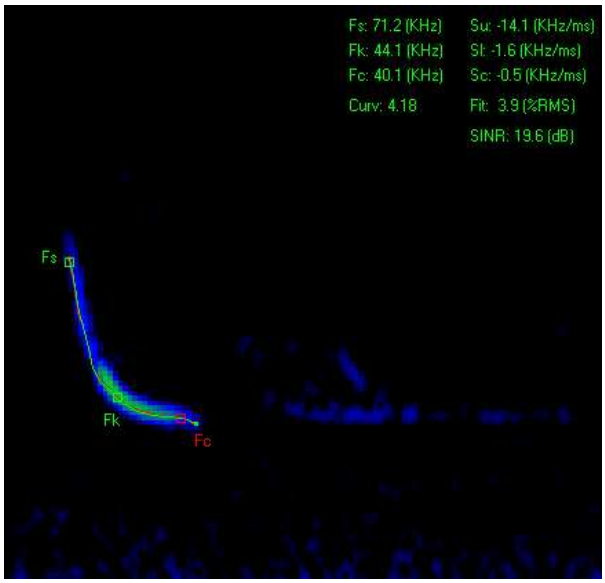

Figure 7c. *Scotorepens greyi* call.

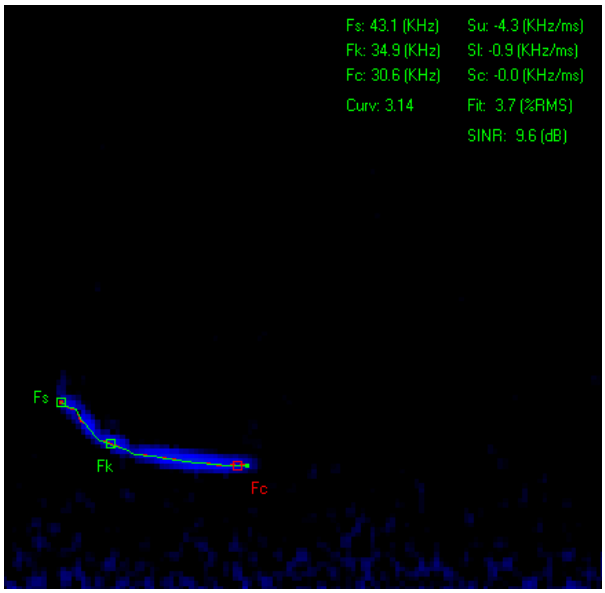

Figure 7d. *Scotorepens balstoni*

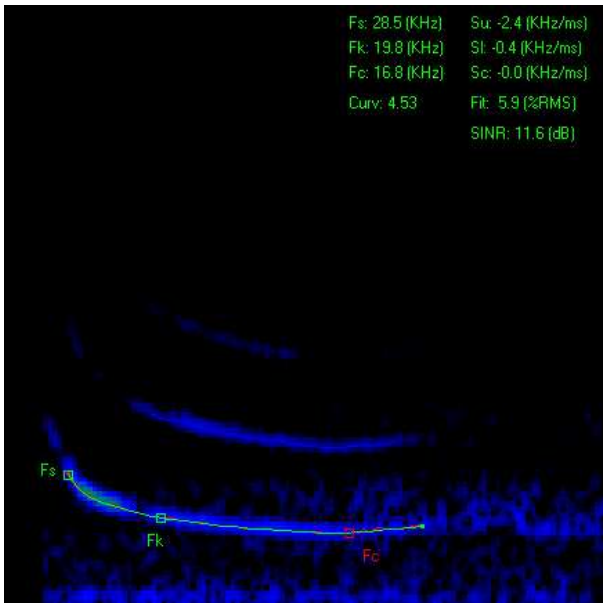

Figure 7e. *Saccolaimus flaviventris* call.

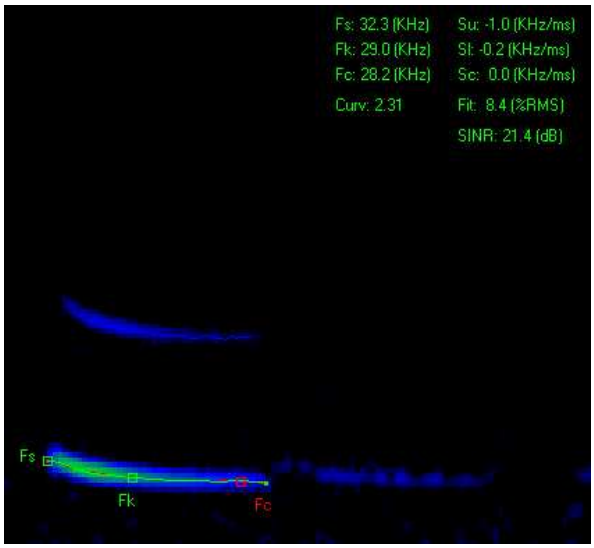

Figure 7f. *Morpmopterus* sp. 3 call.

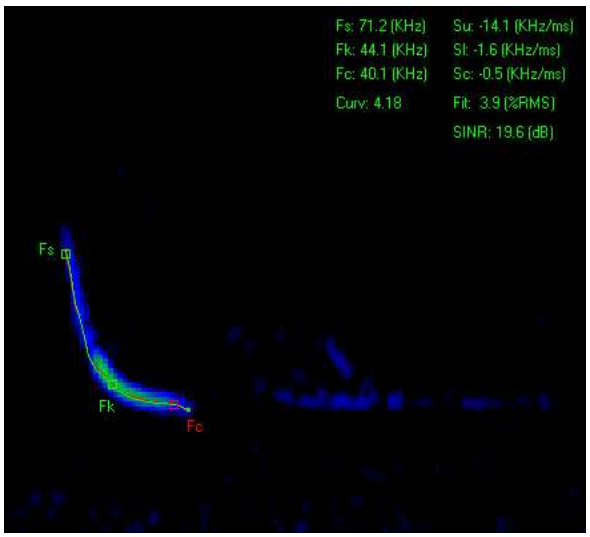

Figure 7g. *Chalinolobus picatus* call.

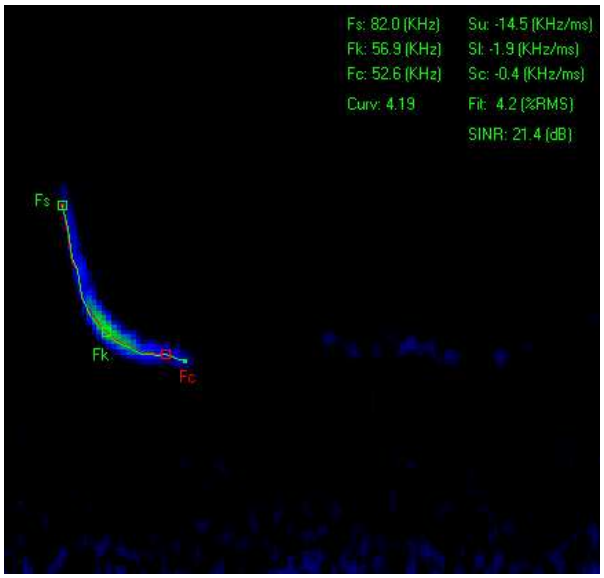

Figure 7h. *Chalinolobus morio* call.

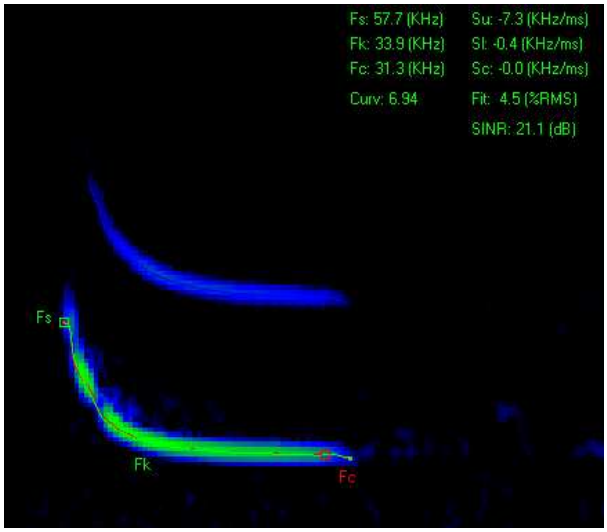

Figure 7i. *Chalinolobus gouldii* call.