

PROJECT CHINA STONE

Terrestrial Ecology Report

PROJECT CHINA STONE

Terrestrial Ecology Impact Assessment

For:

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Final

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CUMBERLAND ECOLOGY

Report No. Q12001RP3

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Glossary of Terms

AEIS	Additional Environmental Impact Statement
BAMM	Biodiversity Assessment and Mapping Methodology
BoM	Commonwealth Bureau of Meteorology
BPA	Biodiversity Planning Assessment
CAMBA	China Australia Migratory Bird Agreement
CCM&RP	Carmichael Coal Mine and Rail Project
DNRM	Department of Natural Resources and Mines
DotE	Commonwealth Department of the Environment
EA	Environmental Authority
EHP	Queensland Department of Environment and Heritage Protection
EIS	Environmental Impact Statement
EO Act	Queensland *Environmental Offsets Act 2014*
EO Regulation	*Environmental Offsets Regulation 2014*
EP Act	Queensland *Environmental Protection Act 1994*
EP Regulation	Queensland *Environmental Protection Regulation 2008*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPBC Act Environmental Offsets Policy	EPBC Act Environmental Offsets Policy 2012
EPBC Act Significant Impact Guidelines	*Matters of National Environmental Significance - Significant Impact Guidelines 1.1* (DotE, 2013)
Fauna Survey Guidelines	*Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland* (Eyre *et al.*, 2012)
GDE	Groundwater Dependent Ecosystem
GES wetland	Wetland of General Ecological Significance
GPS	Global Positioning System
ha	hectare
HES wetland	Wetland of High Ecological Significance
IR	Infra-red
JAMBA	Japan Australia Migratory Bird Agreement
LCF	Landscape Fragmentation and Connectivity
LP Act	Queensland *Land Protection (Pest and Stock Route Management) Act 2002*

MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	Queensland *Nature Conservation Act 1992*
NC WM Regulation	Queensland *Nature Conservation (Wildlife Management) Regulation 2006*
QEOP	Queensland *Environmental Offsets Policy* (Version 1.0) (EHP 2014b)
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
ROKAMBA	Republic of Korea Australia Migratory Bird Agreement
SEIS	Supplementary Environmental Impact Statement
SPRAT	Species Profile and Threats Database
study area	Area that was the focus of this ecological investigation – equates to area that will form the mining leases for the project
TEC	Threatened ecological community
the project	Project China Stone
the proponent	MacMines Austasia Pty Ltd
The region	Desert Uplands Bioregion
threatened species	Flora and fauna species that are listed under the NC Act and/or the EPBC Act
VM Act	Queensland Vegetation Management Act 1999
WPA	Wetland Protection Area

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Chapter **1**

Introduction

1.1 Project Overview

Cumberland Ecology was commissioned by Hansen Bailey on behalf of MacMines Austasia Pty Ltd (the proponent) to complete a Terrestrial Ecology Impact Assessment as part of the Environmental Impact Statement (EIS) for Project China Stone (the project).

The project involves the construction and operation of a large-scale coal mine on a greenfield site in Central Queensland. The project site (the area that will ultimately form the mining leases for the project) is remote, being located approximately 270 km south of Townsville and 300 km west of Mackay at the northern end of the Galilee Basin (**Figure 1**). The closest townships are Charters Towers, approximately 285 km by road to the north, and Clermont, approximately 260 km by road to the south-east. The project site comprises approximately 20,000 ha of well vegetated land, with low-lying scrub in the south and east and a densely vegetated ridgeline, known as 'Darkies Range', running north to south through the western portion of the site.

The mine will produce up to approximately 55 million tonnes per annum of Run of Mine thermal coal. Coal will be mined using both open cut and underground mining methods (**Figure 2**). Open cut mining operations will involve multiple draglines and truck and shovel pre-stripping. Underground mining will involve up to three operating longwalls. Coal will be washed and processed on site and product coal will be transported from site by rail. It is anticipated that mine construction will commence in 2016 and the mine life will be in the order of 50 years.

The majority of the mine infrastructure will be located in the eastern portion of the project site (**Figure 2**). Infrastructure will include coal handling and preparation plants, stockpiles, conveyors, rail loop and train loading facilities, workshops, dams, tailings storage facility and a power station. A workforce accommodation village and private airstrip will also be located in the eastern part of the project site.

The scope of this Terrestrial Ecology Impact Assessment is restricted to assessing activities that are proposed to be undertaken within the project site and no off-lease activities are considered in this assessment.

1.2 Report Terminology

The study area for the purposes of this Terrestrial Ecology Impact Assessment is the same as the project site (i.e. the area that will form the mining leases for the project).

The term “drainage line” has been used in this report to describe any natural feature that conveys surface water during rainfall events. The site does not contain any watercourses as defined under the Queensland *Water Act 2000*.

1.3 Regional Context

The study area is located in the Desert Uplands Bioregion (the region) (**Figure 3**), in the Alice Tableland sub-bioregion. The region straddles the Great Dividing Range between Blackall and Pentland (**Figure 3**) and has a semi-arid climate with variable summer-dominant rainfall (DEWHA, 2008). The region lies within the eastern margin of the Great Artesian Basin and is dominated by sandstone ranges and sand plains (DEWHA, 2008). Three broad soil types predominate in the region: clay soils; sands and massive earths; and skeletal soils (DNRM, 2001).

Clay soils within the region support Brigalow (*Acacia harpophylla*), Dawson River Gum (*Eucalyptus cambageana*), Gidgee (*Acacia cambagei*) and Blackwood (*Acacia melanoxylon*). This vegetation represents the most fertile areas of the bioregion. The sands and massive earths support Eucalyptus woodlands such as Ironbark (*Eucalyptus whitei, E. melanophloia, E. crebra*), Box (*E. populnea, E. brownii*), Bloodwoods (*Corymbia* spp.*)* and Yellow Jacket (*Eucalyptus similis*), which make up about 86% of the bioregion. The skeletal soils support a range of *Eucalyptus* spp. and *Acacia* spp. The most widespread examples include Narrow-leafed Ironbark (*Eucalyptus drepanophylla*), Bendee (*Acacia catenulata*) and thickets of Lancewood (*Acacia shirleyi),* which grow on the ranges and rocky outcrops (Fensham and Fairfax, 2007).

The majority of the land in the region is leasehold and is mainly used for cattle grazing on native pastures. There are also coal exploration activities within the region.

1.4 Description of Study Area

The south-eastern part of the study area is characterised by flat to undulating plains with sandy loam soils that support large expanses of savannah woodlands. These plains graduate to elevated sandstone ranges to the north and west of the study area that supports low Eucalyptus woodlands and shrublands. Darkies Range is to the west of the study area and rocky outcrops with sandstone overhangs are present in the northern area.

The entire study area is remnant vegetation comprising Eucalyptus and Acacia open woodland. The study area is located in the headwaters of North and Tomahawk Creeks and drains predominantly eastwards from Darkies Range. The study area itself is relatively dry and is characterised by ephemeral drainage lines, two seasonal wetlands and artificial farm dams.

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Chapter **2**

Regulatory Framework

2.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth government's principal piece of environmental legislation, and is administered by the Commonwealth Department of the Environment (DotE). It is designed to protect national environmental assets, known as Matters of National Environmental Significance (MNES), which include threatened species of flora and fauna, threatened ecological communities (TECs), migratory species as well as other protected matters. Among other things, it defines the categories of threat for threatened flora and fauna, identifies key threatening processes to their survival and provides for the preparation of recovery plans for threatened flora and fauna.

Any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES is termed a Controlled Action and is subject to assessment under the EPBC Act.

The project has been declared a Controlled Action and requires approval under the EPBC Act before it can proceed. The Controlling Provisions include listed threatened species and communities; listed migratory species; and a water resource, in relation to coal seam gas development and large coal mining development.

2.2 Queensland Vegetation Management Act 1999

The Queensland *Vegetation Management Act 1999* (VM Act) is administered by the Queensland Department of Natural Resources and Mines (DNRM). The VM Act, in conjunction with the Queensland *Sustainable Planning Act 2009,* regulates the clearing of native vegetation in Queensland. The VM Act's objectives include the preservation of remnant endangered ecosystems and vegetation in areas of high nature conservation value or lands vulnerable to land degradation.

The VM Act does not apply to mining activities undertaken on mining leases; however, it is relevant to this assessment as it provides for the classification of remnant vegetation into Regional Ecosystems (REs) which form the basis of the assessment of vegetation communities. REs are defined by Sattler and Williams (1999) as vegetation communities in a bioregion that are consistently associated with a particular combination of geology,

landform and soil. The Queensland government maintains RE maps illustrating the distribution of REs throughout Queensland and these are updated periodically to reflect refinements that have been made through ground-truthing these communities.

Remnant vegetation is referred to under the VM Act as vegetation where the dominant canopy has >70% of the height and >50% of the cover, relative to the height and canopy cover of the pristine (undisturbed) vegetation community. Remnant vegetation must also be dominated by species characteristic of the vegetation community in its pristine condition.

REs are assigned one of the following three categories under the VM Act (Sattler and Williams, 1999):

- Endangered: Remnant vegetation that is less than 10% of its pre-clearing extent across the bioregion; or 10 - 30% of its pre-clearing extent remains and the remnant area is less than 10,000 ha;
- Of Concern: Remnant vegetation that is 10 - 30% of its pre-clearing extent across the bioregion; or more than 30% of its pre-clearing extent remains and the remnant area is less than 10,000 ha; and
- Least Concern: Remnant vegetation that is over 30% of its pre-clearing extent across the bioregion and the remnant area is greater than 10,000 ha.

The Queensland government also assigns a biodiversity status to each RE, in addition to the status under the VM Act. The biodiversity status has no formal regulatory meaning under the VM Act but is used for a variety of planning and management applications.

2.3 Queensland Nature Conservation Act 1992

The Queensland *Nature Conservation Act 1992* (NC Act) is the key piece of legislation in Queensland relating to the protection and management of biodiversity and threatened species. It establishes a framework for the identification, gazettal and management of protected areas (such as National Parks) and the protection of native flora and fauna (protected wildlife) listed under the Queensland *Nature Conservation (Wildlife) Regulation 2006*. The NC Act is administered by the Queensland Department of Environment and Heritage Protection (EHP).

The NC Act classifies native flora and fauna species into categories of conservation significance including Extinct in the Wild, Endangered, Vulnerable, Near Threatened, Special Least Concern and Least Concern in recognition of how threatened they are and what action needs to be taken to protect them.

Impacts to, and offsetting for species listed as Endangered, Vulnerable and Special Least Concern (non-migratory species) under the NC Act are considered in detail within this report. There is no requirement under the Environmental Offsets Act 2014 (EO Act) to offset impacts to Special Least Concern (migratory species). However, Special Least Concern (migratory species) that are concurrently listed under the EPBC Act and which have been

recorded or have a high or moderate likelihood of occurence in the study area have been assessed and considered within this report. Species listed as Near Threatened are not discussed in detail within this report as there is no requirement under the EO Act to offset impacts to these species.

The proponent will need to comply with the NC Act, particularly in regard to obtaining the following approvals for the project:

- Where there is a requirement for the clearing of plants protected under the NC Act (including endangered, vulnerable and near threatened species) a clearing permit under the NC Act will be required;
- Where the activities of the proponent may cause disturbance to animal breeding places, the proponent must prepare a Species Management Program under section 332 of the Queensland *Nature Conservation (Wildlife Management) Regulation 2006* (NC WM Regulation) and obtain approval from the EHP; and
- Any spotter catcher employed by the project must be in possession of a Rehabilitation Permit (spotter catcher endorsement) for managing fauna during clearing activities (section 207 of NC WM Regulation*)*.

If it is necessary to remove animals posing a threat to human health or property, a Damage Mitigation Permit under section 181 of the NC WM Regulation is required.

2.4 Queensland Land Protection (Pest and Stock Route Management) Act 2002

The Queensland *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) provides a framework for the control of declared pests. Schedule 2 of the Queensland *Land Protection (Pest and Stock Route Management) Regulation 2003* lists three classes of declared pests (Class 1, 2 and 3). The LP Act operates in conjunction with the Queensland *Plant Protection Act 1989*, which provides for the control and eradication of pest plants, invertebrate animals, fungi, viruses and diseases that are harmful to crop plants in Queensland. The LP Act is administered by the Department of Agriculture and Fisheries.

A Class 1 declared animal or plant is one that is not commonly present in Queensland, and has the potential to cause an adverse economic, environmental or social impact to Queensland, another state or a part of Queensland or another state.

Class 2 and Class 3 declared animals and plants are those that are established in Queensland and that are causing, or have the potential to cause, adverse economic, environmental or social impacts in Queensland, another state or a part of Queensland or another state.

The LP Act requires landowners to take reasonable measures to keep their land free of declared plants and animals with different levels of control required for the three different

classes of pest described under the LP Act. Weed and pest control measures proposed for the project are discussed in **Section 6.3.2**.

2.5 Queensland Environmental Protection Act 1994

The Queensland *Environmental Protection Act 1994* (EP Act) is administered by the EHP and was established to protect Queensland's environment, while allowing for development that improves the total quality of life, both now and in the future.

The EP Act uses a number of mechanisms to achieve its objectives, including the following that are relevant to this report:

- Requirement for mining projects to obtain an Environmental Authority (EA) prior to operation; and
- Requirement for an environmental impact assessment process in support of an EA application.

2.6 Back on Track Species

The Back on Track Species Prioritisation Framework is an initiative of the Queensland government that (EHP, 2014a):

- Prioritises Queensland's native species to guide conservation management and recovery;
- Enables the strategic allocation of limited conservation resources for achieving greatest biodiversity outcomes; and
- Increases the capacity of government, natural resource management bodies and communities to make informed decisions by making information widely accessible.

The EHP has developed a list of species that are known to occur in the Burdekin Natural Resource Management region (within which the study area lies) that are ranked as 'Critical' or 'High' by the Back on Track Species Prioritisation Framework (DERM, 2010a).

2.7 Biodiversity Planning Assessments

The Biodiversity Assessment and Mapping Methodology (BAMM) has been prepared to provide a consistent approach for assessing biodiversity values at the landscape scale in Queensland using vegetation mapping data generated or approved by the Queensland Herbarium as a fundamental basis. It is being used by the EHP to generate Biodiversity Planning Assessments (BPAs) for each of Queensland's bioregions, including the Desert Uplands Bioregion where the project is located (**Figure 3**).

BPAs are developed in two stages: 1) diagnostic criteria, and 2) supplementary/expert panel criteria. The Stage 1 diagnostic criteria involve the integration of ecological criteria using BAMM to determine the relative Biodiversity Significance. The Stage 2 supplementary criteria allow for the refinement of the mapped information from Stage 1 by incorporating local knowledge and expert opinion.

The methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes.

2.8 International Treaty Obligations on Migratory Species

Australia is signatory to several agreements relating to migratory species. Migratory species listed under the following agreements and conventions are protected in Australia through being listed as MNES (Migratory Controlling Provision) under the EPBC Act:

- China–Australia Migratory Bird Agreement (CAMBA);
- Japan–Australia Migratory Bird Agreement (JAMBA);
- Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA); and
- Convention on the conservation of migratory species of wild animals (Bonn Convention).

The JAMBA, CAMBA and ROKAMBA agreements list terrestrial, water and shorebird species which migrate between Australia and the respective countries. In all cases, the majority of listed species are shorebirds (DotE, 2014e).

All agreements require the parties to protect migratory birds by:

- Limiting the circumstances under which migratory birds are taken or traded;
- Protecting and conserving important habitats;
- Exchanging information; and
- Building cooperative relationships.

The JAMBA agreement also includes provisions for cooperation on the conservation of threatened birds.

Australian government and non-government representatives meet every two years with Japanese and Chinese counterparts to review progress in implementing the agreements and to explore new initiatives to conserve migratory birds (DotE, 2014e).

The ROKAMBA formalises Australia's relationship with the Republic of Korea in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (DotE, 2014e).

In addition to these bilaterial agreements, Australia is also a signatory of the Bonn Convention. This convention aims to conserve terrestrial, aquatic and avian migratory species throughout their range (CMS, 2015).

2.9 Government Mapping

2.9.1 Map of Referrable Wetlands

The EHP has a range of policies and programs to manage wetlands. As part of a broader policy of wetland protection, and in accordance with schedule 12, part 2 of the Queensland *Environmental Protection Regulation 2008* (EP Regulation), the EHP has prepared a map of referable wetlands. The map of referable wetlands includes:

- Wetland protection areas (WPAs), which comprise:
  - Wetlands of high ecological significance (HES wetlands) located within Great Barrier Reef catchments; and
  - Trigger areas that represent the area of hydrological influence of HES wetlands. Outside urban areas, the trigger area is 500 m from the edge of a HES wetland.
- Wetlands of General Ecological Significance (GES wetlands).

WPAs and HES wetlands contain wetland environmental values as listed under section 81A of the EP Regulation. WPAs are derived using a mapping method developed by the EHP called the Aquatic Biodiversity Assessment and Mapping Method.

Significant residual impacts on WPAs are required to be offset in accordance with the Queensland Environmental Offsets Framework (**Section 2.11**). This issue is considered further in the EIS Aquatic Ecology Report.

2.9.2 Vegetation Management Wetlands Map

The Queensland government has produced a vegetation management wetlands map under section 20AA of the VM Act. This map shows wetlands, as defined under the VM Act. It is used primarily to regulate vegetation clearing in areas mapped as wetlands.

Significant residual impacts on REs that intersect with an area shown as a wetland on the vegetation management wetlands map are required to be offset (to the extent of the intersection) (**Section 2.11**). This is described further in **Section 4.1.7**.

2.9.3 Vegetation Management Watercourse Map

The Queensland government has produced a vegetation management watercourse map under section 20AB of the VM Act. This map shows watercourses, as defined under VM Act. It is used primarily to regulate vegetation clearing in proximity of watercourses. The map is produced based on desktop information and includes stream order mapping under the Strahler method. It should be noted that the definition of watercourse under the VM Act is different to the definition under the Queensland *Water Act 2000*.

Significant residual impacts on REs located within a defined distance of watercourses shown on the vegetation management watercourse map are required to be offset (**Section 2.11**). This is described further in **Section 4.1.8**.

2.9.4 Groundwater Dependent Ecosystem Mapping

The Commonwealth Bureau of Meteorology (BoM) has produced a Groundwater Dependent Ecosystem (GDE) Atlas, which provides ecological and hydrogeological information on known GDEs and ecosystems that could potentially use groundwater. The GDE Atlas collates information from a number of sources into a central database, including published research and interpreted remote sensing data. The GDE Atlas mapping is described further in **Section 4.1.9** and the potential for GDEs to occur within the study area is discussed in **Section 4.4**.

2.9.5 Queensland Wetland Data Springs Mapping

The Queensland government has prepared the Queensland Wetland Data Springs mapping, which show the location of springs in the state. These springs are dependent on the surface expression of groundwater and their locations are used to infer the location of potential GDEs. The Queensland Wetland Data Springs database mapping is described further in **Section 4.1.9**.

2.9.6 Queensland Essential Habitat Mapping

Essential habitat is mapped by the EHP and is vegetation in which a species that is Endangered, Vulnerable or Near Threatened has been known to occur. The EHP essential habitat mapping is described further in **Section 4.1.11**.

2.10 Commonwealth Environmental Offsets Policy

Under the *EPBC Act Environmental Offsets Policy 2012* (EPBC Act Environmental Offsets Policy), environmental offsets are actions taken to counterbalance significant residual impacts on MNES. Offsets are used as a last resort in instances where an action will give rise to significant residual impacts, even after the application of management measures.

The EPBC Act Environmental Offsets Policy came into force in October 2012 and provides guidance on the role of offsets in environmental impact assessments and how DotE considers the suitability of a proposed offset package (SEWPaC, 2012).

According to the policy, an offsets package is a "*suite of actions that a proponent undertakes in order to compensate for the residual significant impact of a project"* (SEWPaC, 2012). It can comprise a combination of direct offsets and other compensatory measures.

Direct offsets are those actions that provide a measurable conservation gain for an impacted protected matter. Direct offsets are an essential component of a suitable offsets package. A minimum of 90% of the offset requirements for any given impact must be met through direct offsets. Other compensatory measures are those actions that do not directly offset the impacts on the protected matter, but are anticipated to lead to benefits for the impacted protected matter, for example funding for research or educational programs (SEWPaC, 2012).

2.11 Queensland Environmental Offsets Policy

Queensland recently passed the EO Act along with the *Environmental Offsets Regulation 2014* (EO Regulation). The *Queensland Environmental Offsets Policy (Version 1.1)* (QEOP) (EHP, 2014c) came into force on 19 December 2014. The EO Act, EO Regulation and QEOP comprise the Queensland Environmental Offsets Framework. According to this framework, it is necessary to provide offsets for any significant, residual impacts on Matters of State Environmental Significance (MSES).

The EO Regulation prescribes a number of MSES that are potentially relevant to terrestrial ecology. These include:

- Regulated vegetation under the VM Act that are:
  - Endangered REs;
  - Of Concern REs;
  - REs that intersect with wetlands identified on the vegetation management wetlands map;
  - REs that comprise an area of essential habitat, in accordance with the VM Act, for protected wildlife; and
  - REs located within a defined distance from the defining banks of a relevant watercourse.
- Connectivity areas, comprising remnant REs that contain an area of land that is required for ecosystem functioning (i.e. a connectivity area);
- Wetlands in a WPA or a HES wetland as shown on the map of referrable wetlands;
- A designated precinct in a strategic environmental area;
- High risk areas identified on the flora survey trigger map that contains flora species that are listed as Endangered or Vulnerable under the NC Act;

- Areas not identified as a high risk area on the flora survey trigger map, to the extent that the area contains flora species that are listed as Endangered or Vulnerable under the NC Act;
- A non-juvenile koala habitat tree located in an area shown as bushland habitat, high value rehabilitation habitat or medium value rehabilitation habitat on the map called 'Map of Assessable Development Area Koala Habitat Values' that applies under the South East Queensland Koala Conservation State Planning Regulatory Provisions is a matter of State environmental significance;
- Habitat for terrestrial fauna species that are listed as Special Least Concern (as defined within the EO Regulation), Vulnerable or Endangered under the NC Act;
- Protected areas; and
- Legally secured offset areas.

The MSES relevant to the project are discussed in **Section 4**.

The EHP released guidelines *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (EHP, 2014d) in December 2014, which have been used where relevant in this report and have been used to determine if offsets are required.

The QEOP has identified Strategic Offset Investment Corridors which are areas where land may be suitable for management activities that provide a benefit to environmental matters likely to be impacted by development (EHP, 2014c). The Galilee Basin is the first Strategic Offset Investment Corridor to be mapped.

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Chapter **3**

Methodology

The methodology utilised in this terrestrial ecology assessment included a desktop study (**Section 3.1**) comprising: database analysis (**Section 3.1.1**), literature review of the environmental assessments prepared for the Carmichael Coal Mine and Rail Project (CCM&RP) (**Section 3.1.2**), review of aerial photographs (**Section 3.1.3**) and review of existing RE, geology and soils mapping within the study area (**Sections 3.1.4** to **3.1.6**). **Section 3.2** describes the field surveys undertaken, **Section 3.3** describes the methodology used to map threatened fauna species potential habitat within the study area and **Section 3.4** outlines the process used to assess a species likelihood of occurrence. Methodology limitations are outlined in **Section 3.5**.

Field identification was made using Brooker and Kleinig (2004), Sharp and Simon (2002), and Maslin (2001). Where a common name exists, it is used after the first full text reference. As described below, the majority of plant species found were collected and pressed and identifications subsequently verified at the Queensland Herbarium.

Nomenclature and taxonomy for fauna species follows the following references: Tyler and Knight (2009) for amphibians; Wilson (2005) for reptiles; Pizzey and Knight (2003) for birds; Menkhorst and Knight (2004) mammals; and Churchill (2009) for bats.

3.1 Desktop Study

3.1.1 Database Analysis

Prior to the fieldwork and during the preparation of the report, database searches were conducted, and government mapping was consulted. Database searches and mapping review included the following:

- EPBC Act Protected Matters Search Tool (DotE, 2015), accessed on 2 March 2015 (10 km search from the boundary of the study area) (**Appendix A**);
- VM Act RE and Remnant Map (version 6.1 to version 8.0) of the study area;
- Queensland Wildlife Online threatened species database (EHP, 2015), accessed on 2 March 2015 (25 km search radius from three central points in the centre of the study area) (**Appendix B**);

- Queensland Museum Database (Queensland Museum, 2015), accessed on 5 March 2015, (25 km search from the boundary of the study area);
- HERBRECS data from the Queensland Herbarium (**Appendix C**), accessed on 4 March 2015 (25 km search from the boundary of the study area);
- Map of referrable wetlands;
- Vegetation management wetlands map (version 2.15);
- Vegetation management watercourse map (version 1.3);
- GDE Atlas mapping (BOM, 2014a);
- Queensland Wetland Data Springs Mapping (version 3);
- BPA – Desert Uplands (version 1.3);
- Category A and B environmentally sensitive areas as defined under the EP Regulation*;* and
- Essential habitat map (version 4.15).

3.1.2 Literature Review

As shown on **Figure 3**, the study area adjoins the recently approved CCM&RP. There is a high degree of commonality between the CCM&RP and the project given the proximity of the CCM&RP and similarity of the landscapes. For this reason, flora and fauna literature published recently for the CCM&RP was reviewed at the commencement of this project and used wherever relevant to inform field survey design, impact assessment (e.g. cumulative impact assessment) and offsetting.

Relevant reports for the approved CCM&RP that were reviewed are outlined below.

- **EIS**
  - GHD (2012c) Terrestrial Ecology Report;
  - GHD (2012b) Matters of National Environmental Significance; and
  - GHD (2012a) Moray Downs Black-throated Finch Surveys.
- **Subsequent EIS (SEIS)**
  - GHD (2013b) Report for Updated Mine Ecology;
  - GHD (2013a) Report for Matters of National Environmental Significance; and
  - GHD (2013c) Report for Black-throated finch On-site Monitoring Survey 1.

- **Additional EIS (AEIS)**
  - GHD (2014a) Black-throated Finch Management Plan;
  - GHD (2014b) Report for Black-throated finch On-site Monitoring Survey 2; and
  - Eco Logical Australia (2014) Ecological Equivalence Assessment Stage 2.

Appendix D provides details of the flora and fauna surveys undertaken for the CCM&RP. **Appendix D** demonstrates that the flora and fauna of the locality (all land within a 25 km radius of the study area) is well understood and there has been substantial survey effort in the local area that has been undertaken in all seasons spanning the years 2008 to 2014. Information from these surveys, along with other background information, was used when designing the field surveys and identifying threatened species with the potential to occur in the study area for the project. It also assisted in making a determination of the probability of a species being present, in instances where potential occurrences of species were identified from database searches but the species was not recorded during surveys.

3.1.3 Review of Aerial Photographs

The most recent aerial photographs (flown October 2012 and October 2013) were utilised for the assessment. This was used to identify features for ground-truthing during the field survey, to identify appropriate survey locations, and for determining and characterising potential terrestrial flora and fauna habitats.

3.1.4 Regional Ecosystem Mapping

The Queensland government produces RE maps showing the distribution of remnant REs throughout Queensland. These published maps are produced using Landsat satellite imagery, aerial photography and field based ground-truthing. A review of the RE maps was undertaken prior to field surveys to assist in the verification of RE types mapped in the study area.

3.1.5 Geological Mapping

Geological mapping of the study area has been undertaken and is provided in the EIS Groundwater Report. The geological mapping was reviewed in order to provide an indication of the underlying substrate and to inform habitat mapping for species such as bats that require particular geological land forms such as crevices to roost in. The geological mapping was also used to assist in ground-truthing and verifying REs within the study area.

3.1.6 Soil Mapping

The soils mapping provided in the EIS Soils and Land Suitability Report was reviewed. The soil mapping was used to correlate vegetation types and habitat preferences of particular flora and fauna to soil types present in the study area. Soils information was also used to assist in ground-truthing and verifying REs within the study area.

3.2 Terrestrial Ecology Field Surveys

3.2.1 Survey Timing

Terrestrial flora and fauna field surveys were conducted in the study area in three survey periods; between 16 May and 25 May 2012, between 22 October and 9 November 2012, and between 14 October and 20 October 2013.

3.2.2 Project Team

Two teams of two ecologists were used, with each team focussing on either terrestrial flora or fauna ecology with help from generalist field assistants to transport equipment, set up traps and sort and preserve biological specimens as required. Details of the field team members are provided in **Appendix E**.

3.2.3 Field Survey Design

Initially a site reconnaissance was undertaken of the entire study area for two days between 1 May and 3 May 2012 using a helicopter. This was completed to gain an appreciation of the study area and to obtain an overview of the environments present. This site reconnaissance enabled the development of a strategic field survey program. During the aerial reconnaissance, all parts of the study area were observed from the air. The helicopter landed at several locations and notes and photographs were taken of the landforms present, habitat values and vegetation types.

Subsequently, three rounds of field survey were undertaken in May 2012, October/November 2012 and October 2013. Due to the large size of the study area, field surveys were conducted in strategic locations and the results extrapolated by analysis of high resolution aerial photography, geological maps and topographic maps. Field survey locations were carefully chosen to sample all of the ecosystem types occurring in the study area, including the range of physiographic areas which occur in the study area.

In order to access the entire study area, a helicopter was used during the May 2012 surveys to transport field teams to survey the more remote areas of the study area. This enabled a detailed assessment of the biodiversity occurring across the entire study area including otherwise inaccessible savannah woodland, narrow forest valleys, cliffs, plateaus and scarps. For the more accessible areas in the southern portion of the study area, 4WD vehicles were used. Vehicular access was more available during field surveys undertaken in October/November 2012 and October 2013, as the area was relatively dry compared to during the May 2012 survey.

The survey in October 2013 was undertaken primarily for the purpose of obtaining better access to the south-eastern section of the study area. Issues with land owner approvals had previously prevented full access to this area.

3.2.4 Climatic Conditions

The timing of the field surveys were chosen in order to capture the effects of seasonality on the abundance of flora and fauna species. The survey periods are in accordance with the *Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland* (herein referred to as the Fauna Survey Guidelines) (Eyre *et al.*, 2012) that state that surveys in the region in which the study area occurs should be conducted in two periods: spring to early summer (September to mid-November); and in autumn (March to mid-May). The rationale behind these recommended survey timings is that as temperatures begin to warm up after winter there is a peak in vertebrate activity with the commencement of breeding activity in many species. The exact timing is dependent on the timing of the onset of spring, when temperatures begin to warm but before summer temperatures become too high as many species, especially reptiles, become less active. This period can be very dry so conducting a second survey during moist periods is critical, which is why the autumn survey in May was conducted.

The weather conditions during the May 2012 survey period were characterised by clear, warm days and cool to cold nights. No rainfall occurred during the majority of the field survey, however on the last day of this round of surveys, it was rainy.

The weather conditions during the October/November 2012 survey period were characterised by warm to hot days, and moderately warm nights. The majority of the survey period was dry; however a localised heavy downpour of approximately 60 mm of rain was experienced in the southern part of the study area at the end of the survey period. The northern part of the study area experienced little rain from that heavy rain event. Some days were relatively windy.

The weather conditions during the October 2013 survey period were characterised by warm sunny weather. No rainfall was recorded, and temperatures were relatively high.

The closest meteorological station to the project is the BoM's Carmichael Weather Station (Station Number 036122), located 11.5 km to the south-west of the study area (**Figure 3**). The Carmichael Weather Station does not measure temperature and this data was obtained from BoM's Clermont Airport Weather Station (Station Number 035124), located approximately 170 km to the south-east of the project. Observed meteorological conditions during the three survey periods are presented in **Table 3.1** (BOM, 2014b).

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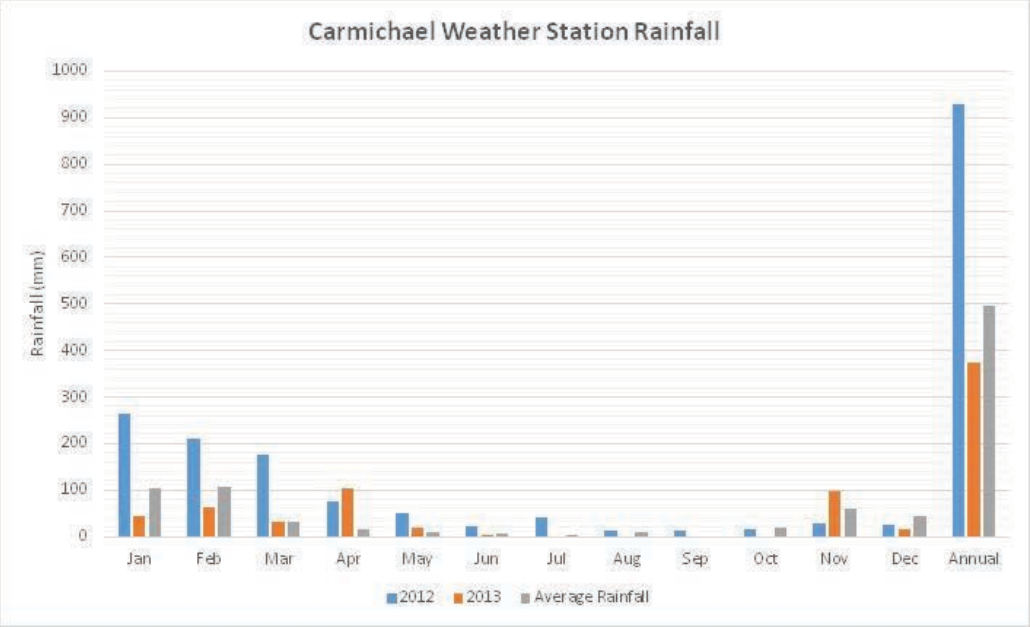
Table 3.1 Meteorological Conditions During Field Surveys

Date	Clermont Airport (035124) Weather Station		Carmichael (036122) Weather Station
	Minimum Temperature (ºC)	Maximum Temperature (ºC)	Rainfall (mm)
Survey 1			
16/05/2012	0.8	24.3	0
17/05/2012	7.3	25.2	0
18/05/2012	9.0	25.6	0
19/05/2012	7.4	24.8	0
20/05/2012	5.5	25.2	0
21/05/2012	7.0	25.4	0
22/05/2012	9.1	25.1	0
23/05/2012	15.7	23.8	0
24/05/2012	17.4	20.2	0.2
25/05/2012	15.1	15.7	45.2
Survey 2			
22/10/2012	16.5	36.9	0
23/10/2012	17.1	32.6	0
24/10/2012	14.7	30.3	0
25/10/2012	12.9	30.9	0
26/10/2012	12.0	34.5	0
27/10/2012	15.7	33.0	0
28/10/2012	15.3	22.6	0
29/10/2012	16.8	24.8	0
30/10/2012	17.2	27.4	15.4
31/10/2012	18.2	31.1	0
1/11/2012	14.0	34.1	0
2/11/2012	19.4	37.6	0
3/11/2012	20.5	37.1	0
4/11/2012	17.4	32.9	0
5/11/2012	20.6	33.3	0
6/11/2012	15.0	33.3	0
7/11/2012	14.8	32.7	0
8/11/2012	16.8	33.8	0
9/11/2012	20.2	31.5	2

Date	Clermont Airport (035124) Weather Station		Carmichael (036122) Weather Station
	Minimum Temperature (ºC)	Maximum Temperature (ºC)	Rainfall (mm)
Survey 3			
14/10/2013	18.9	34.1	0
15/10/2013	11.0	31.9	0
16/10/2013	14.8	31.9	0
17/10/2013	17.0	32.5	0
18/10/2013	16.9	33.4	0
19/10/2013	16.9	33.3	0
20/10/2013	20.8	32.9	0

Source: BoM (2014b).

Temperatures within the study area are typical of the sub-tropical Queensland climate, with warmer summer months during December, January and February and cooler winter months in June, July and August. The first, second and third survey periods experienced maximum and minimum temperatures ranging between 25.6ºC and 0.8ºC; 37.6ºC and 12ºC ; and 34.1ºC and 11ºC , respectively (**Table 3.1**). Rainfall occurred on two days during both the first second survey periods, while the third survey period experienced no rainfall (**Table 3.1**). **Graph 1** shows 2012 and 2013 rainfall vs median rainfall at the Carmichael Weather Station. As can be seen from **Graph 1**, above average rainfall levels were experienced in 2012, while 2013 showed below average rainfall levels for the entire year. The May 2012 survey was preceded by several months of well above average rainfall. May 2012 was the first opportunity in 2012 to access the study area, given that extremely wet conditions prolonged access during January to April 2012.



Graph 1 Rainfall Recorded at the Carmichael Weather Station in 2012 and 2013

3.2.5 Flora Survey

Flora field surveys were undertaken in three periods:

- 16 May to 24 May 2012;
- 29 October to 9 November 2012; and
- 14 October to 20 October 2013.

Flora surveys were undertaken in the major REs present in the study area, at representative locations established following the desktop assessments and initial aerial reconnaissance. **Figures 4** and **5** show formal survey locations and the tracks and trails where additional ancillary notes and plant specimen collections were made during the field survey.

The flora survey methods were consistent with the Methodology for Survey and Mapping of Regional Ecosystems and Communities in Queensland, Version 3.1 (Neldner *et al.*, 2005) and Version 3.2 (Neldner *et al.*, 2012), which was released after the first round of field surveys. The secondary and quaternary survey methodology was used during vegetation mapping to determine whether vegetation comprised "remnant vegetation" and to accurately identify REs.

A total of 77 secondary flora quadrats were surveyed in the study area over three survey periods (**Figure 4**), which consisted of flora sampling within 10 x 50 m quadrats, and the collection of the following data:

- All species present in each stratum and their relative dominance;
- Median heights of each stratum present;
- Percentage crown cover for each stratum present;
- Estimated crown cover class for the ecologically dominant layer;
- A photograph of each quadrat; and
- Location (using handheld Global Positioning System (GPS) unit).

A total of 676 quaternary surveys were also conducted in the study area (**Figure 4**), which consisted of collecting the following data:

- Location (using handheld GPS unit);
- Dominant canopy and sub-canopy species;
- Notes about soil, aspect and slope; and
- Photographs.

Quaternary surveys were conducted from the ground (either from a vehicle or on foot) and also from the air using a helicopter. As quaternary surveys are designed to be rapid assessments of the vegetation type present, it is considered acceptable to conduct these surveys from a vehicle and helicopter (Neldner *et al.*, 2012). The use of a helicopter enabled the collection of extensive data on the floristic composition of the entire study area, and a total of 619 aerial quaternary data points were completed.

In order to maximise the species list of plants compiled for the site, and to document the species from each RE, additional searches and informal "track notes" were made. This work included random meander searches conducted in the vicinity of each of the 77 quadrats and at 40 other flora search areas, which were sites of botanical interest (**Figure 4**). Notes were also made of species occurrences when travelling between sites along the many tracks used during the investigation (**Figure 5**).

Vegetation mapping (or verification of any existing vegetation mapping) was undertaken in the study area with particular reference to REs listed as Of Concern or Endangered under the NC Act and TECs listed under the EPBC Act. Vegetation communities were identified according to the Queensland government's RE type descriptions in accordance with the Regional Ecosystem Description Database (REDD) (Queensland Herbarium, 2014). Identification of REs was achieved by comparison between the floristic composition of the vegetation recorded in the field, and the formal descriptions of REs contained in the REDD (Queensland Herbarium 2014). The location and extent of REs was mapped using field data and extrapolated using aerial imagery analysis. RE mapping included identification of sensitive or important vegetation types, such as riparian vegetation and potential GDEs. The resultant information was synthesised using GIS to create a spatial database and utilised to produce ground-truthed RE mapping of the study area.

A large collection of plant specimens was made during the flora survey periods to ensure accurate identification and to search for potential new species or significant range extensions. These were dry pressed in paper while in the field, and subsequently curated and preserved after completion of the field trip. Names of the plant species identified were entered into appropriate spreadsheets at the completion of the survey. Specimens of uncertain taxonomy, and all potential threatened flora species were submitted to the Queensland Herbarium for formal identification.

3.2.6 Fauna Survey

Fauna field surveys were undertaken in three periods:

- 16 May to 25 May 2012;
- 22 October to 2 November 2012; and
- 14 October to 20 October 2013.

The fauna surveys utilised the following methods:

- Elliott A and cage traps to detect terrestrial mammals;

- Funnel traps and pitfall traps used in conjunction with drift netting for reptiles and small mammals;
- Hair tube sampling to detect terrestrial mammals;
- Infra-red (IR) camera traps to detect trap-shy fauna species;
- Anabat bat detectors to record bats, placed at strategic locations such as near tree hollows and water sources;
- Targeted spotlighting searches for threatened frogs, reptiles, owls and nocturnal mammals;
- Call playback for threatened bird species;
- Active searches for reptiles; and
- Visual and aural surveys for diurnal birds.

Fauna surveys were undertaken within 100 x 100 m generic fauna sites which are described in **Table 3.2** and shown on **Figure 6**. **Figure 6** does not show the location of individual traps, hair tubes, etc. that were used as these were placed within the generic fauna site.

Table 3.2 Description of Habitat at Generic Fauna Sites

Generic Fauna Site ID[1]	Site Location	Vegetation Description	Representative Photograph
1	414987E, 7586064N	Located within RE 10.3.6/10.5.5a. Ironbark dominates the canopy within the site and surrounding areas with some regeneration of Ironbark observed. No blossom present at the time of survey. The site had a grassy understorey. Habitat features recorded include fallen logs, fine litter and grass.	
2	416668E, 7583733N	Located along a sandy ephemeral drainage bed within RE 10.3.6/10.5.5a. Ironbark dominates the canopy along the creek line as well as adjacent areas. The understorey is dominated by grasses and moisture-loving monocots. At the time of survey, water was not flowing along the ephemeral drainage line, however there were isolated pools of water. Habitat features recorded include fallen logs, coarse litter, grass and bare ground.	

Generic Fauna Site ID[1]	Site Location	Vegetation Description	Representative Photograph
3	416175E, 7581201N	Located within RE 10.5.1a/10.5.1c. Yellow Jacket (*Eucalyptus similis*) dominates the low open canopy within the site as well as adjacent areas. No blossom present at the time of survey. The site has a grassy understorey with Grass Trees (*Xanthorrhoea johnsonii*) also common. Habitat features recorded include decorticating bark, coarse litter and grass.	
4	412220E, 7590303N	Located along a sandy creek bed within RE 10.7.3c/10.7.12a. Forest Red Gums (*Eucalyptus tereticornis*) dominates the canopy along the creek line as well as adjacent areas. The understorey is grassy. Habitat features recorded include hollow-bearing trees, fallen logs, decorticating bark, coarse litter, fine litter, bare ground, stones, boulders and rock crevices.	

Generic Fauna Site ID[1]	Site Location	Vegetation Description	Representative Photograph
5	411579E, 7588680N	Located within RE 10.10.4c/10.10.1a/10.10.4a/10.10.3. The site has abundant *Acacia* spp. in the midstorey. No blossom present at the time of survey. The site has a grassy understorey. The site contained abundant rocky outcrops. Habitat features recorded include fallen logs, fine litter, grass, large boulders and rock crevices.	
6	413819E, 7589732N	Located within RE 10.5.1a. The canopy is dominated by Yellow Jacket and the shrub layer comprises a dense stand of *Acacia* spp. The site is located along an access track on sandy soils. Habitat features recorded include fine litter, grass and bare ground.	

Generic Fauna Site ID[1]	Site Location	Vegetation Description	Representative Photograph
7	415440E, 7591756N	Located in an ephemeral drainage line within RE 10.5.5a. Forest Red Gum dominated the canopy within the drainage line, with Ironbark at the edges. Regeneration of canopy species observed. Some canopy trees in flower at the time of survey. The site had a grassy understorey with abundant leaf litter. Disturbance from cattle (tracks and scats) were observed. No water was present within the ephemeral drainage line at the time of survey. Habitat features recorded include hollow-bearing trees, fallen logs, coarse litter, grass and soil cracks.	
8	417280E, 7591438N	Located within RE 10.3.28a/10.3.6a adjacent to a farm dam. Forest Red Gum dominated the canopy within the site, with Ironbark observed in the adjacent areas. Some canopy trees in flower at the time of survey. The site had a grassy understorey with non-grass monocots common and abundant leaf litter. Disturbance from cattle (tracks and scats) were observed. No water was present within the ephemeral drainage line at the time of survey. Habitat features recorded include fallen logs, coarse litter and grass.	

Generic Fauna Site ID[1]	Site Location	Vegetation Description	Representative Photograph
9	408736E, 7594334N	Located along a sandy ephemeral drainage line within RE 10.3.11a/10.5.4b/10.3.14d. Canopy species include Ironbark, Yellow Jacket and Forest Red Gum. Regeneration of canopy species observed. Some canopy trees in flower at the time of survey and some Mistletoe (*Amyema quandang*) observed. No water was present within the ephemeral drainage line at the time of survey. Habitat features recorded include coarse litter, bare ground, grass, stone and boulders.	
10	409483E, 7603885N	Located within RE 10.5.1a. Extensive regeneration of Ironbark present along with Yellow Jacket and a low *Acacia* spp. shrub layer. No blossom present at the time of survey. Termite mounds were observed in the vicinity of the site. Habitat features recorded include fallen logs and coarse litter.	

Generic Fauna Site ID[1]	Site Location	Vegetation Description	Representative Photograph
11	408401E, 7602406N	Located within RE 10.3.15k adjacent to Red Dog Dam. Reid River Box (*Eucalyptus brownii*) present in the canopy and dominating the surrounding vegetation. Canopy species and mistletoe in flower at the time of survey. Piles of timber present within the site in proximity to the dam edge. Habitat features recorded include fallen logs, bare ground, grass and soil cracks.	
12	409339E, 7597086N	Located in proximity to a remnant pool within RE 10.10.1a/10.10.4a/10.7.3c. Canopy species include Yellow Jacket and Figs (*Ficus rubiginosa*), with a midstorey of *Acacia* spp. Site extended down a sandy and rocky ephemeral drainage line. Habitat features recorded include hollow-bearing trees, fallen logs, decorticating bark, coarse litter, fine litter, bare ground, stones, boulders and rock crevices.	

Generic Fauna Site ID[1]	Site Location	Vegetation Description	Representative Photograph
13	421030e, 7590393N	Located in proximity to a remnant pool within a drainage line in a tributary of Tomahawk Creek within RE 10.3.28a/10.3.6a. Site extended adjacent to a mostly dry rocky ephemeral drainage line. Habitat features recorded include a remnant pool containing water, hollow-bearing trees, fallen logs, decorticating bark, coarse litter, fine litter, bare ground, stones, boulders and rock crevices. The ground layer vegetation of grasses had died back and there was substantial dry ground.	
14	420614E, 7586509N	Located within RE 10.5.1a in sand plains in the south-east of the study area. Canopy species include Yellow Jacket and Silver-leaved Ironbark (*Eucalyptus melanophloia*). The midstorey was largely absent, and there was a grassy ground layer. Habitat features recorded include fallen logs, decorticating bark, coarse litter, fine litter and bare ground. The ground layer vegetation of grasses had died back and there was substantial dry ground. Coarse woody debris was scarce, and no hollows were recorded from the trees in this area. Cattle have access to this area and tracks and scats were recorded, although no cattle were observed.	

Generic Fauna Site ID[1]	Site Location	Vegetation Description	Representative Photograph
15	420555E, 7583299N	Located within RE 10.3.6/10.5.5a in sand plains in the south-east of the study area. The canopy was sparse and low, and species include Narrow-leaved Ironbark. There was no defined midstorey, however large shrubs (*Acacia* spp. and Bootlace Oak [*Hakea lorea*]) dominated the vegetation in many places. There was a thick grassy ground layer. Habitat features recorded include decorticating bark, coarse litter, fine litter and bare ground. The ground layer vegetation of grasses had died back and there was substantial dry ground. Coarse woody debris was scarce, and no hollows were recorded from the relatively small trees in this area. Cattle have access to this area and tracks and scats were recorded, although no cattle were observed.	

[1] Site ID for the purposes of this table, number is not shown on **Figure 6**

The first survey period (May 2012) was conducted prior to the release of the Fauna Survey Guidelines, and although the methodology used during the first survey period was slightly different to the Fauna Survey Guidelines, it is considered to be equivalent in terms of survey effort and techniques and it contained most of the techniques that are included in the Fauna Survey Guidelines. The second and third round of fauna surveys were conducted in accordance with the Fauna Survey Guidelines.

The Fauna Survey Guidelines specify the establishment of a 100 x 100 m generic fauna survey site, within which fauna traps are set and a range of surveys for birds, mammals and reptiles are conducted. A total of 15 generic fauna sites were established across all three survey periods. The differences between the first and subsequent rounds of survey are minor, and mainly differentiate in the layout of the trapping transects and the number and type of bird and reptile searches within each generic fauna survey site. Hair tubes were not used during the second and third rounds of surveys, as the Fauna Survey Guidelines recommend that hair tubes be used for targeted surveys, rather than as a routine method at the generic fauna survey sites. The use of pitfall traps is specified in the Fauna Survey Guidelines for generic fauna survey sites, and these were included for the second and third rounds of field survey.

The field survey methodology is consistent with the Fauna Survey Guidelines and with the EPBC Act survey guidelines for threatened frogs, reptiles, birds, mammals and bats (DEWHA, 2010a; DEWHA, 2010b;SEWPaC, 2011b; SEWPaC, 2011a). **Appendix F** provides a summary of the survey effort undertaken in comparison to Commonwealth and state survey guidelines.

A summary of the total survey effort undertaken within the survey area during the three survey periods is outlined in **Table 3.3**.

Table 3.3 Survey Effort Undertaken During the Field Surveys

Survey Timing	Elliot A Traps		Cage Traps		Funnel Traps		Pitfall Traps		IR Camera		Anabat Detectors		Hair tubes		Bird Census		Remnant Pool IR Cameras		Active Searches for Amphibians and Reptiles		Spotlighting		Call Playback	
	No. of sites	Total trap nights	No. of sites	Total trap nights	No. of sites	Total trap nights	No. of sites	Total trap nights	No. of sites	Total trap nights	No. of sites	Total trap nights	No. of sites	Total trap nights	No. of sites	No. of person hours	No. of sites	Total trap nights	No. of sites	No. of person hours	No. of sites	No. of person hours	No. of sites	No. of person hours
Survey 1 16 – 25 May 2012	150	600	60	240	30	120	0	0	6	24	6	24	60	480	24	12	2	8	25	12.5	6	6	6	6
Survey 2 22 October – 9 November 2012	120	480	0	0	36	144	24	96	8	40	8	32	0	0	25	15.5	5	28	24	21	6	6	6	6
Survey 3 14 October – 20 October 2013	60	240	0	0	18	72	12	48	3	18	3	12	0	0	16	9.5	1	4	12	10.5	3	3	3	3
TOTAL	330	1,320	60	240	84	336	36	144	17	76	17	68	60	480	65	37	8	40	61	44	15	15	15	15

i. Elliott A Traps

Elliott A trapping was conducted at a total of 15 locations in the study area; six during the first survey period, six during the second survey period and three during the third survey period over a period of four consecutive days and nights (**Figure 6**). During the first survey period, six generic fauna survey sites contained 25 Elliott A traps, however for the second and third survey periods the generic fauna survey sites contained 20 Elliott A traps, in accordance with the Fauna Survey Guidelines. These were set approximately 5-10 m apart, in two rows on either side of the generic fauna survey site. A total of 1,320 Elliott trap nights were conducted over all survey periods (**Table 3.3**).

The Elliott A traps were baited with a mixture of peanut butter, honey and rolled oats. The Elliott A traps were checked at dawn and any fauna captured were identified and released. The Elliott A traps were then closed until late afternoon, when the traps were re-baited and opened for the night.

ii. Cage Traps

During the first survey period, 10 cage traps were set at each of the six generic survey sites over a period of four consecutive days and nights (**Figure 6**). The use of cage traps was discontinued after the first round of surveys as the updated Fauna Survey Guidelines state that they are not necessary if IR cameras are used. A total of 240 cage trap nights were conducted over the first survey period (**Table 3.3**).

The cage traps were baited with a mixture of peanut butter, honey and rolled oats and set approximately 20 m apart depending on available habitat. The cage traps were checked at dawn and any fauna captured were identified and released. The cage traps were then closed until late afternoon, when the traps were re-baited and opened for the night.

iii. Funnel Traps

Funnel traps were utilised to survey for small terrestrial fauna, and drift fencing was erected along each funnel trap line to direct fauna towards the traps. During the first survey period, five funnel traps were established along a funnel trap line at each of the six generic fauna survey sites (**Figure 6**). During the second and third survey periods, each funnel trap line consisted of six funnel traps at each of the generic fauna survey sites (**Table 3.3**). A total of six sites were surveyed during the second survey period, and three sites were surveyed during the third survey period. This equates to nine survey locations. Each funnel trap was left out for four consecutive days and nights. Funnel traps were checked early each morning, and any fauna found were identified and released. A total of 336 funnel trap nights were undertaken over all survey periods (**Table 3.3**).

For the second and third survey periods, the configuration of the drift fence along which the funnel traps were established was altered slightly to provide a T-section, with the long side being 30 m long, and one side fence attached at right angles that was approximately 7.5 m long.

iv. Pitfall Traps

Pitfall trapping was undertaken during the second and third survey periods with four pitfall traps being established at each of the generic fauna survey sites (**Table 3.3**; **Figure 6**). The traps were left in place for four consecutive days and nights. A total of 144 pitfall trap nights were undertaken over the second and third survey periods (**Table 3.3**).

Pitfall traps consisted of a 20 litre bucket sunk into the ground into which leaves and rocks were placed to provide shelter for any trapped animals. The drift fence along which the pitfall traps were established was configured in a T-section, with the long side being 30 m long, and one side fence attached at right angles that was approximately 7.5 m long.

v. Infra-red Cameras at Generic Fauna Sites

IR cameras were used during all of the survey periods, with one IR camera being placed at each of the generic fauna survey sites. The IR cameras were left for a total of four consecutive days and nights at each location (**Figure 6**). IR cameras were deployed for a total of 76 survey nights (**Table 3.3**).

The IR cameras were attached to trees and either focused upon nearby buried bait (chicken necks or rolled oats and peanut butter) or placed near remnant pools. The traps were baited once and replenished as necessary. The IR cameras begin recording when nearby fauna movement activates the motion sensor. Recorded footage was collected and analysed to identify the detected fauna species.

vi. Remnant Pool Infra-red Cameras

IR cameras were used to survey remnant pools during the survey periods in order to supplement the field survey results, particularly for birds. This technique is especially effective in the dry season, when there is little water available in the landscape, and birds depend on a small number of waterholes for their daily water requirements. A total of eight waterholes were surveyed using IR cameras over the three survey periods, for a total of 40 days (**Table 3.3**).

vii. Anabat Detectors

Six Anabat units were used during the first survey period, eight (six at generic fauna survey sites and two at other locations) during the second survey period and three during the third survey period (**Figure 6**; **Table 3.3**). These were established in likely places to record bat calls such as in flyways in the forest or adjacent to potential foraging areas such as ephemeral drainage lines. All Anabat units were left for a total of four consecutive nights at each location (**Table 3.3**).

A total of 68 nights of Anabat data were collected from the study area during all periods of survey (**Table 3.3**).

viii. Hair Tubes

"Faunatech" hair tubes were used during the first round of field surveys in May 2012 to complement the trapping surveys and to detect small and medium-sized terrestrial mammals. A hair tube is a funnel shaped piece of plastic that is baited at the narrow end and lined with strong adhesive tape. Mammals enter the funnel to reach the bait, and some hairs are removed by the adhesive tape. These are subsequently analysed by specialist taxonomists to determine the identity of each animal. Three hair tube transects were established in the study area during the first round of survey, each containing 20 hair tubes (**Figure 6**; **Table 3.3**). The hair tubes were placed on the ground along each transect approximately 10 m apart, and baited with rolled oats, peanut butter and honey. The hair tubes were baited once and left for eight consecutive days and nights. This resulted in a total of 480 nights of hair tube surveys (**Table 3.3**).

Hair tubes were not used during the second and third rounds of surveys, as the updated Fauna Survey Guidelines recommend that hair tubes be used for targeted surveys, rather than as a routine method at the generic fauna survey sites. Based on the desktop assessment, the protected fauna species that potentially occur within the study area are not species for which hair tubes would be an effective method.

ix. Bird Census

Bird census surveys were conducted at a total of 65 locations during all survey periods (**Table 3.3 and Figure 6**). During the first survey period, surveys were undertaken via a 30 minute diurnal bird census at a total of 24 locations (**Table 3.3**). During the second and third survey periods, six, 10 minute area bird surveys were undertaken within a 100 x 100 m quadrat at 25 and 16 locations, respectively, in accordance with the Fauna Survey Guidelines.

Bird census surveys were undertaken for a total of approximately 37 hours over three survey periods in the study area (**Table 3.3**).

To further extend the level of survey undertaken for threatened birds, observations were made whilst driving along roads, tracks and fence lines where access was permitted. This involved driving slowly and stopping periodically to look for birds or when birds were observed. Tracks followed during the first and second survey periods are shown on **Figure 6**. This is a highly effective technique that enables large areas to be surveyed. All birds encountered during surveys were identified and recorded. In addition, a 30 minute diurnal bird census (bird census) was conducted at 50 additional locations in the study area (**Figure 6**). Diurnal birds were also identified and recorded incidentally as they were encountered throughout the study area during all three survey periods. GPS coordinates were recorded at sightings of any threatened or migratory bird species.

x. Active Searches for Amphibians and Reptiles

Diurnal and nocturnal active searches of suitable habitats for amphibians and reptiles were conducted within the study area at a total of 61 locations (**Figure 6**; **Table 3.3**). These systematic surveys involved searching beneath rocks and leaf litter within areas of suitable

habitat. Active searches of suitable habitat were also conducted during other diurnal and nocturnal activities throughout the study area. Searches involved lifting of bark, fallen logs, bushrock and scraping of top soil. Captured animals were identified and then released. Amphibian surveys included diurnal and nocturnal habitat searches of damp and watery areas including wet tracks and road-side ditches.

Diurnal and nocturnal active searches were conducted in all survey periods. During the first survey period, active searches were conducted at 25 locations (**Table 3.3**) in areas considered to comprise suitable habitat for amphibians and reptiles. Each search involved 30 person minute searches of areas approximately 100 m x 100 m.

Active searches conducted during the second and third survey periods were altered slightly to be in accordance with the updated Fauna Survey Guidelines. Diurnal active searches involved two x 30 person minute searches in each 100 m x 100 m location, at separate 50 x 50 m sections of each location at each time. Nocturnal active searches involved two x 30 person minute searches in each location, across the entire 100 m x 100 m generic fauna survey site. During the second and third survey periods, active searches were also conducted at other areas considered to comprise suitable habitat for amphibians and reptiles. Each search involved 30 person minute searches of areas approximately 100 m x 100 m.

A total of 44 person hours were spent actively searching for amphibians and reptiles (**Table 3.3**).

xi. Spotlighting

Spotlighting was conducted at 15 locations for nocturnal mammals, birds and reptiles using a hand-held spotlight on foot (**Figure 6**; **Table 3.3**). A minimum of two x 30 person minutes of spotlighting was undertaken within and near each generic fauna survey site.

In addition, two spotlighting transects (total of approximately 8 km) were conducted in the study area, and incidental spotlighting was also conducted while travelling between survey locations at night. A total of 15 person hours of spotlighting was conducted in the study area (**Table 3.3**).

xii. Call Playback

Call playback was undertaken at 15 locations for the following species that are recommended by the Fauna Survey Guidelines to be surveyed for in the Desert Uplands: Grass Owl (*Tyto longimembris*), Masked Owl (*Tyto novaehollandiae*) and the Barking Owl (*Ninox connivens*). Calls were broadcast from the centre of each generic fauna survey site on two separate occasions, followed each time by a period of quiet listening.

xiii. Incidental Observations

Any vertebrate fauna species observed, detected on the basis of calls, tracks, scats, scratch markings or otherwise, were recorded and listed in the total species list for the study area.

Incidental records of flora and fauna from areas adjacent to the study area have also been considered.

xiv. Fauna Habitat Assessment

Fauna habitat assessments were undertaken across the study area at each generic fauna survey site by the fauna team, and within all areas that were surveyed for birds during the active searches (**Figure 6**). The study area was assessed for ground, shrub/understorey and canopy cover, number and size of hollows present, habitat features such as bush rock and fallen trees, and signs of fauna usage such as scats and scratches.

Fauna habitat assessments included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, grasses, bush rock, ephemeral drainage lines and seasonal wetlands. An assessment of the structural complexity of vegetation, the age structure of the vegetation and the nature and extent of human disturbance throughout the study area was undertaken and considered. Additional notes were taken on the suitability of the habitat present for the Black-throated Finch (*Poephila cincta cincta*). Indirect indicators of fauna use of the study area such as droppings, diggings, footprints, scratches, nests, burrows, paths and runways were also recorded.

3.2.7 Compliance with Survey Guidelines

Appendix F details the survey requirements for each threatened flora and fauna species listed under the EPBC Act and NC Act, identified from database analysis or from field surveys in the study area, and summarises the relevant survey effort undertaken for the project in consideration of the appropriate Commonwealth and state guidelines.

The survey requirements have been sourced from the relevant Species Profile and Threats Database (SPRAT), as well as other relevant survey guidelines published by the Commonwealth government, including the: *Survey Guidelines for Australia's Threatened Birds* (DEWHA, 2010a), *Survey Guidelines for Australia's Threatened Reptiles* (SEWPaC, 2011b) and *Survey Guidelines for Australia's Threatened Mammals* (SEWPaC, 2011a).

Since the surveys were undertaken new state terrestrial fauna survey guidelines have been released, namely the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland – Version 2.0* (Eyre *et al.*, 2014) as well as several targeted survey guidelines for threatened fauna species. These guidelines have not been used for the surveys undertaken within the study area as they were released after the surveys on-site were undertaken. As indicated in **Section 3.2.6** and **Appendix F**, the field survey methodology was generally compliant with relevant guidelines available at the time of the surveys.

3.3 Habitat Mapping Methods for Threatened Species

For the purposes of impact assessment, habitat modelling and mapping was undertaken for the following threatened fauna species that are known to occur or are assessed as having a high or moderate potential to occur in the study area:

- Squatter Pigeon (southern subspecies) (*Geophaps scripta scripta*);
- Black-throated Finch (white-rumped subspecies);
- Australian Painted Snipe (*Rostratula australis*);
- Koala (*Phascolarctos cinereus*); and
- Short-beaked Echidna (*Tachyglossus aculeatus*).

Other threatened species have been recorded from database analysis however these species are not considered likely to occur and therefore habitat mapping has not been conducted for these species (**Sections 4.5** and **4.6**).

Habitat mapping involved the identification and consideration of species-specific habitat criteria (**Section 3.2.7**) to create a model that enabled mapping of potential high and low value habitat for the five species listed above within the study area. This included consideration of the existing quality/condition of habitat, in relation to the habitat mapping criteria. For example, cattle grazing pressure would impact on the quality and condition of habitat. The criteria considered for threatened species habitat mapping are summarised in **Table 3.4**.

Table 3.4 Threatened Species Habitat Mapping Criteria

Habitat Analysis Criteria	Explanation
Pre-existing models for threatened species habitat	For some species, threatened species habitat models exist within recovery plans, and within EIS reports for projects in the locality (i.e. CCM&RP). Where available, these were reviewed and used to guide habitat mapping for the project.
Threatened species records in the study area	Threatened species recorded during the surveys were mapped to provide an indication of where the species occurred. Where relevant, the REs in which these records were located to assessed, and where relevant, these REs were used to inform habitat mapping across the study area.
Threatened species records in the locality	In the immediate locality of the study area, a suite of recent threatened species surveys have been completed and have generated a substantial set of baseline data about the relevant threatened species within the same or very similar habitats to those in the study area. Where available, this has been used to inform the habitat mapping of the study area.
RE mapping	Where information was known about the REs where a species was routinely found, a preliminary habitat map was generated to show available "potential" vegetation habitat.

Habitat Analysis Criteria	Explanation
Topography/soils	Where published information existed to indicate that a species was more likely to occur, or breed in one form of topography or soils, preferred topography/soils were overlain across preferred vegetation polygons to filter the habitat map.
Permanent water sources	Presence of permanent water sources was used to delineate the preferred habitats and to filter the habitat map. Whilst there are no true "permanent" water sources present within the study area, for the purposes of habitat modelling. Permanent water has been defined as a water source that will persist well into the dry season. These were mapped based on water sources still present in the October 2012 or October 2013 surveys, at the end of the dry season. Permanent water on the study area was limited to two artificial farm dams and small remnant pools in ephemeral drainage lines. Given that all the sources of permanent water are surface water fed, these sources would dry out over extended drought conditions. On this basis, the adopted definition of permanent water is therefore conservative for the purpose of assigning habitat value.
Presence of preferred food plants	Presence of preferred food plants, where known, was considered as a potential filter for habitat mapping.
Presence of tree hollows	Presence of tree hollows, or hollows of a certain size, where known, was considered as a potential filter for habitat mapping.
Foraging distances around permanent water	Published information about foraging distances from permanent water, where known, was used as a factor to filter habitat mapping.
Presumed presence of harmful feral species	The presence of feral animals that are considered harmful to a threatened species was used as a factor to influence the mapping of threatened species habitat.
Sensitivity to cattle grazing pressure	Habitat maps were filtered where it was assessed that cattle grazing pressure was considered likely to be a factor in significantly reducing the suitability of a habitat for a threatened species.

For the purpose of this mapping analysis, the following definitions are applied:

- **High Value Habitat**: habitat containing biological resources of high value that are essential for the persistence of the species. Examples include core breeding habitats around permanent waters, roosting areas for bats and REs containing primary food plants that are essential for a species existence. High value habitats have been mapped for all of the species listed above.
- **Low Value Habitat**: habitat containing biological resources that may be used on occasion for foraging or dispersal, but which are not essential for the species' existence.
- **Unsuitable Habitat**: habitats consisting of vegetation and other habitat features unlikely to be used or inhabited by the species.

The methodology used to model habitat is precautionary, as it is based on landscape scale habitat features that may be indicative, but are not prescriptive of habitat for listed threatened species. The degree of utilisation of areas of habitat by particular species is dependent on a variety of factors such as microhabitat features, presence of threatening processes (e.g. grazing) and population dynamics. Accordingly, potential habitat maps are considered to be a precautionary, indicative estimate of high value habitat.

Detailed habitat mapping criteria applied for threatened fauna species that are known or considered likely to occur in the study area (i.e. Squatter Pigeon [southern subspecies]; Black-throated Finch [white-rumped subspecies]; Australian Painted Snipe; Koala; and Short-beaked Echidna) is presented in **Appendix G**.

3.4 Likelihood of Occurrence Assessment

The database searches identified threatened species that may potentially occur within the study area. The likelihood of such species occurring within the study area was then assessed based on the results of the field surveys.

The likelihood of species occurring within the study area was classified using the criteria presented in **Table 3.5**. The assessment was based on the species known ranges and habitat preferences which were evaluated considering site characteristics observed during the field surveys.

Table 3.5 Criteria to Assess Potential for Species to Occur within the Study Area

Likelihood to Occur	Definition
Present	The species was recorded within the study area during the field surveys.
High	The species was not recorded within the study area during the field surveys but is known to occur within the surrounding area and habitat of suitable quality exists within the study area.
Moderate	The species was not recorded within the study area during the field surveys, although it is known to occur in the wider region. Habitat was identified for the species within the study area during field surveys; however it is marginal, fragmented and/or small in size, or degraded.
Low	The species was not recorded within the study area during the field surveys. The species is unlikely to occur in the wider region and due to a lack of, or extremely poor quality habitat within the study area, the species is not expected to occur within the study area.

A conservative, risk-based approach was adopted to determine the need for an assessment of potential impacts, such as a significance assessment for species listed under the EPBC Act. This approach considers both the likelihood of occurrence of the species within the study area and the significance of potential habitat loss or disturbance resulting from the project's impacts. This approach ensures that potential project-related impacts on threatened species which were recorded within the study area or were considered to have a

moderate or high likelihood to occur within the study area were considered. The criteria for determining if further assessment of potential impacts is required are presented in **Table 3.6**.

Table 3.6 Criteria to Determine if Assessment of Impacts is Required for Species

Likelihood to Occur	No habitat loss or disturbance from the project	Limited habitat loss or disturbance from the project	Significant habitat loss or disturbance from the project
Present	YES	YES	YES
High	NO	YES	YES
Moderate	NO	NO	YES
Low	NO	NO	NO

For species listed under the EPBC Act, the significance of impacts was assessed in accordance with the EPBC Act *Matters of National Environmental Significance - Significant Impact Guidelines 1.1* (DotE, 2013) (herein referred to as the EPBC Act Significant Impact Guidelines).

As there is currently no prescribed methodology for the assessment of potential impacts under the NC Act, assessments of the potential impacts to species listed under the NC Act were undertaken on the basis of the species' known ecology, project design and potential mitigation measures.

3.5 Limitations of the Field Survey and Habitat Modelling

The field surveys were successful and had an appropriate level of coverage of the study area. Moreover, they were generally successful in surveying most of the flora and fauna groups, as explained below.

This report builds on the extensive database of ecological information available from surveys conducted for the adjacent CCM&RP. Accordingly, the report has not relied solely on the information collected during the field surveys of the study area, but has incorporated the relevant findings of numerous surveys conducted over several years and all seasons in nearby areas. Moreover, the data collected for the study area gives a high degree of confidence in the mapping of REs and fauna habitats – all of which occur on and have been studied extensively for other adjacent and nearby sites.

3.5.1 Flora

Flora surveys have been conducted within all the main vegetation types within the study area and over 300 plant specimens have been collected. Surveys have been undertaken over two years, and in different seasons, including following substantial rain. This means that surveys have been conducted when reproductive features required for identification of most species have been present. Notwithstanding that, due to the large size of the study area there remains potential for undetected flora species to occur. Despite this, it is probable that the majority of species have been recorded and that issues including conservation significance of the flora, quality and viability of bushland and any likely project impacts on native vegetation have been able to be satisfactorily assessed.

A precautionary approach has been taken to recording the occurrence of threatened flora species, and threatened species were considered to be present if suitable habitat occurred, even if they were not recorded during the field surveys.

3.5.2 Fauna

Fauna surveys were successful in detecting a wide range of vertebrate fauna, particularly birds, bats and non-flying mammals. The generic fauna survey sites were situated in areas where a number of representative habitat types co-occur and therefore are areas of high species diversity.

The fauna surveys are representative of fauna activity at the time of the survey only. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all flora and fauna species within the study area. The weather in the first survey period had started to cool down and it is likely that reptile activity was lower than in previous months. However, weather conditions during the second and third survey periods in October 2012 and October 2013 were substantially warmer and reptiles were active across the study area. Active searches generally result in a higher number of records than traps, and given the large number of active searches that were conducted across the study area, reptiles are considered to have been adequately surveyed.

It is likely that if continued field sampling was undertaken within the study area, additional species would be identified. Nevertheless, it is considered that the majority of fauna species have been recorded. In common with the flora surveys, a precautionary approach was used to assume presence of some threatened fauna species where the presence of suitable habitat was recorded.

3.5.3 Habitat Modelling

The habitat modelling has been conducted based on published literature of the habitat preferences of the threatened species recorded or with potential to occur in the study area, as well as on direct field based experience of habitat utilisation of species in the study area and from adjacent areas. Another key factor used in many of the habitat maps is the presence and location of permanent water, defined in this report as any suitable water source remaining during the October 2012 and October 2013 field surveys. The habitat modelling data and the areas of habitat mapped may vary according to seasonal conditions, in particular those fauna species relying on the presence of water as a modelling criterion. The Desert Uplands Bioregion (**Figure 3**) is a highly variable environment and in drier seasons, many of the remnant pools recorded may dry out, thereby contracting the areas of mapped habitat. Some pools recorded during the October field surveys dried up during the course of the field work due to stock drinking and evaporation. Conversely, in wetter seasons, more water would remain at the end of the dry season and the areas of the study area able to support species dependent on these pools would increase.

CUMBERLAND ECOLOGY

Chapter **4**

Results

This section provides a description of the terrestrial ecology biodiversity values present in the study area. The following results are discussed in this section:

- Results from the desktop study (**Section 4.1**);
- Overview of the biodiversity values of the study area, including broad vegetation, geology, soils and aquatic ecology (**Section 4.2**);
- Regional ecosystems mapped within the study area (**Section 4.3**);
- GDEs (**Section 4.4**);
- Flora species recorded within the study area (**Section 4.5**); and
- Fauna species recorded within the study area (**Section 4.6**).

4.1 Desktop Study Results

A range of database searches and online searches were conducted for the project and are listed in **Section 3.1.1**. The results of the database and online searches are presented below.

4.1.1 EPBC Act Protected Matters Search

The EPBC Act Protected Matters Search did not record any TECs or threatened flora species, as defined under the EPBC Act, as potentially occurring within the study area (**Appendix A**).

Fauna species predicted to occur within the study area from the EPBC Act Protected Matters Search (**Appendix A**) that are listed as threatened and/or migratory under the EPBC Act are presented in **Table 4.1**.

CUMBERLAND ECOLOGY

Table 4.1 Threatened and Migratory Fauna Species Recorded in the EPBC Act Protected Matters Search

Scientific Name	Common Name	Status[1]	
		EPBC Act	NC Act[2]
Reptiles			
Egernia rugosa	Yakka Skink	V	V
Denisonia maculata	Ornamental Snake	V	V
Birds			
Anseranas semipalmata	Magpie Goose	M	-
Apus pacificus	Fork-tailed Swift	Mi, M	-
Ardea ibis	Cattle Egret	Mi, M	-
Ardea modesta	Eastern Great Egret	Mi+, M	-
Erythrotriorchis radiatus	Red Goshawk	V	E
Gallinago hardwickii	Latham's Snipe	Mi, M	-
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	V	V
Haliaeetus leucogaster	White-bellied Sea-Eagle	Mi, M	-
Merops ornatus	Rainbow Bee-eater	Mi, M	-
Neochmia ruficauda ruficauda	Star Finch (eastern)	E	E
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	E	E
Rostratula australis	Australian Painted Snipe	E, Mi*, M*	V
Mammals			
Macrotis lagotis	Greater Bilby	V	E
Phascolarctos cinereus	Koala	V	SLC

1 Threatened, migratory and/or marine fauna species status under the EPBC Act and/or NC Act (current at 6 March 2015).
E = Endangered; V = Vulnerable; Mi = Migratory; M = Marine; SLC = Special Least Concern (non-migratory).

2 Excludes Special Least Concern (migratory) species.

\+ Species listed as a marine species under the EPBC Act as Great Egret (*Ardea alba*).

* Species listed as marine and migratory under the EPBC Act as Painted Snipe (*Rostratula benghalensis*) (sensu lato).

These threatened and migratory fauna species are discussed further in **Sections 4.6.6** and **4.6.7**, respectively. An assessment of the likelihood of occurrence in the study area of threatened fauna species recorded during the surveys or from database analysis was conducted and is presented in **Appendix H**.

One place on the Register of National Estate was recorded by the EPBC Act Protected Matters Search, namely Lake Buchanan and Catchment (**Appendix A**). Lake Buchanan is a large (approximately 11,700 ha) saltwater lake located approximately 17 km via direct line to the west of the study area (**Figure 3**). The catchment of Lake Buchanan extends from Darkies Range to the west of the site. Only an extremely minor area in the northern boundary of the study area is within the Lake Buchannan catchment.

As indicated in the EIS Surface Water Section, both Lake Buchanan and Lake Galilee lie within closed, internally draining sub-basins located in the Thomson Basin. The Thomson Basin is a sub-catchment of the Cooper Creek Basin. The catchment of Lake Buchanan is bounded to the east by Darkies Range. The project will not impact surface water drainage to these lakes. In addition, the EIS Groundwater Report concludes that no significant groundwater impacts on Lake Buchanan will occur as a result of the project.

4.1.2 VM Act Regional Ecosystem and Remnant Map

According to the Queensland government RE and Remnant Map (Version 8.0) the entire study area is characterised by remnant vegetation. No High Value Regrowth vegetation is mapped as present in the study area. The study area has been mapped by the Queensland government as supporting a total of 29 REs, including one Of Concern RE listed under the VM Act, and 30 Least Concern REs (**Table 4.2**; **Figure 7**). No REs listed as Endangered under the VM Act were mapped as occurring in the study area.

Table 4.2 Regional Ecosystems Mapped by the Queensland Government within the Study Area

RE Code	Description[1]	Conservation Status		
		EPBC Act[2]	VM Act[3]	Biodiversity Status[3]
10.3.6a	*Eucalyptus brownii* open-woodland on alluvial plains	-	Least Concern	No concern at present
10.3.10	*Corymbia dallachiana* and *C. terminalis* open-woodland on old alluvial plains (western)	-	Least Concern	No concern at present
10.3.11a	*Corymbia leichhardtii* woodland on alluvium in valleys	-	Least Concern	No concern at present
10.3.14c	Sandy river beds	-	Least Concern	Of Concern
10.3.14d	*Eucalyptus camaldulensis* with or without *Corymbia leichhardtii* open-woodland along watercourses	-	Least Concern	Of Concern
10.3.15k	*Eucalyptus brownii* open-woodland in closed depressions	-	Least Concern	Of Concern
10.3.16d	Ephemeral lakes with sparse-herbland or sparse-tussock grassland	-	Least Concern	Endangered
10.3.28a	*Eucalyptus melanophloia* open-woodland on sandy alluvial fans	-	Least Concern	No concern at present
10.5.1a	*Eucalyptus similis* open-woodland on sand plains	-	Least Concern	No concern at present
10.5.1c	*Eucalyptus similis* and *Corymbia setosa* low open-woodland on sand plains	-	Least Concern	No concern at present
10.5.1d	*Corymbia setosa* low open-woodland on sand plains	-	Least Concern	No concern at present
10.5.4a	*Eucalyptus crebra* open-woodland on sand plains	-	Least Concern	No concern at present

RE Code	Description[1]	Conservation Status		
		EPBC Act[2]	VM Act[3]	Biodiversity Status[3]
10.5.4b	*Eucalyptus crebra* open-woodland on sand plains	-	Least Concern	No concern at present
10.5.5a	*Eucalyptus melanophloia* open-woodland on sand plains	-	Least Concern	No concern at present
10.5.10	*Corymbia leichhardtii* open-woodland on sand plains	-	Least Concern	No concern at present
10.7.2a	*Eucalyptus persistens* low open-woodland with soft spinifex on ferricrete above scarps	-	Least Concern	No concern at present
10.7.3a	*Acacia catenulata* low woodland on scarps	-	Least Concern	No concern at present
10.7.3b	*Acacia shirleyi* woodland on scarps	-	Least Concern	No concern at present
10.7.3c	*Corymbia lamprophylla* and/or *C. leichhardtii* open-woodland on ferricrete above scarps	-	Least Concern	No concern at present
10.7.4	*Eucalyptus persistens* low open-woodland on pediments below scarps	-	Least Concern	No concern at present
10.7.5	*Eucalyptus thozetiana* open-woodland on scarps and on pediments below scarps	-	Least Concern	Of Concern
10.7.7b	*Melaleuca tamariscina* low open-woodland on ferricrete	-	Least Concern	No concern at present
10.7.11a	*Eucalyptus melanophloia* low open-woodland on ferricrete	-	Least Concern	No concern at present
10.7.12a	*Eucalyptus drepanophylla* open-woodland on ferricrete	-	Least Concern	No concern at present
10.10.1a	*Acacia shirleyi* woodland on sandstone ranges	-	Least Concern	No concern at present
10.10.1b	*Acacia catenulata* low woodland on sandstone ranges	-	Least Concern	No concern at present
10.10.3	*Eucalyptus drepanophylla* open-woodland on sandstone ranges	-	Of Concern	Of Concern
10.10.4a	*Corymbia leichhardtii* open-woodland on sandstone ranges	-	Least Concern	No concern at present
10.10.4c	*Eucalyptus similis* open-woodland on sandstone ranges	-	Least Concern	No concern at present

1 DSITIA (2012) *Regional Ecosystems Technical Description of the Desert Uplands.*

2 TEC status under the EPBC Act (current at 6 March 2015).

3 RE Status under the VM Act (current at 6 March 2015).

4.1.3 Queensland Wildlife Online Database Search Results

A total of eight threatened flora species listed under the EPBC Act and/or NC Act that were listed in the Queensland Wildlife Online database search (**Appendix B**) as occurring within the locality are presented in **Table 4.3**.

Table 4.3 Threatened Flora Species Queensland Wildlife Online Database Results

Scientific Name	Common Name	Status[1]	
		EPBC Act	NC Act
Ammannia robertsii	-	-	E
Eriocaulon carsonii	Salt Pipwort	E	E
Eryngium fontanum	Blue Devil	E	E
Hydrocotyle dipleura	-	-	V
Lawrencia buchananensis	-	V	V
Livistona lanuginosa	Waxy Cabbage Palm	V	V
Myriophyllum artesium	-	-	E
Sporobolus pamelae	-	-	E

[1] Threatened flora species status under the EPBC Act and/or NC Act (current at 6 March 2015).
E = Endangered; V = Vulnerable

These threatened flora species listed under the EPBC Act and/or NC Act are discussed further in **Sections 4.5.1** and **4.5.2**, respectively.

Fauna species recorded in the locality in the Queensland Wildlife Online database search (**Appendix B**) that are listed as threatened and/or migratory under the EPBC Act and/or the NC Act are presented in **Table 4.4**.

Table 4.4 Threatened and/or Migratory Fauna Species Queensland Wildlife Online Database Results

Scientific Name	Common Name	Status[1]	
		EPBC Act	NC Act[2]
Birds			
Actitis hypoleucos	Common Sandpiper	Mi, M	-
Calidris acuminata	Sharp-tailed Sandpiper	Mi, M	-
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	V	V
Hydroprogne caspia	Caspian Tern	Mi	-
Merops ornatus	Rainbow Bee-eater	Mi, M	-
Plegadis falcinellus	Glossy Ibis	Mi, M	-
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	E	E
Tringa nebularia	Common Greenshank	Mi, M	-
Tringa stagnatilis	Marsh Sandpiper	Mi, M	-

Scientific Name	Common Name	Status[1]	
		EPBC Act	NC Act[2]
Mammals			
Phascolarctos cinereus	Koala	V	SLC
Tachyglossus aculeatus	Short-beaked Echidna	-	SLC

1 Threatened, migratory and/or marine species status under the EPBC Act and/or NC Act (current at 6 March 2015).
E = Endangered; V = Vulnerable; Mi = Migratory; M = Marine; SLC = Special Least Concern (non-migratory).

2 Excludes Special Least Concern (migratory) species.

\+ Species listed as a marine species under the EPBC Act as Great Egret (*Ardea alba*).

* Species listed as marine and migratory under the EPBC Act as Painted Snipe (*Rostratula benghalensis*) (sensu lato).

Several of these species were also predicted to occur in the EPBC Act Protected Matters Search (**Table 4.1**; **Section 4.1.1**). Species listed under the EPBC Act and under the NC Act are discussed further in **Sections 4.6.6** to **4.6.9**. An assessment of the likelihood of occurrence in the study area of threatened fauna species recorded during the surveys or from database analysis was conducted and is presented in **Appendix H**.

4.1.4 Queensland Museum Database Search Results

The Queensland Museum database (Queensland Museum, 2015) returned 15 records of terrestrial vertebrates, none of which are listed under either the EPBC Act or the NC Act. These were five frogs: the Ornate Burrowing Frog (*Platyplectrum ornatus*), New Holland Frog (*Cyclorana novaehollandiae*), Rough Frog (*Cyclorana verrucosa*), Peters' Frog (*Litoria inermis*), Striped Rocketfrog (*Litoria nasuta*); six reptiles: Northern Velvet Gecko (*Oedura castelnaui*), Eastern Barred Wedge-snout Ctenotus (*Ctenotus strauchii*), Stout Bar-sided Skink (*Eulamprus sokosoma*) , Eastern Robust Slider (*Lerista punctatovittata*), Northern Dwarf Skink (*Menetia maini*), Black-headed Monitor (*Varanus tristis*); and four mammals: Lakeland Downs Mouse (*Leggadina lakedownensis*), Delicate Mouse (*Pseudomys delicatulus*), Desert Mouse (*Pseudomys desertor*) and Pebble- mound Mouse (*Pseudomys patrius*).

4.1.5 HERBRECS Data from the Queensland Herbarium Database Search Results

A total of eight threatened flora species listed under the EPBC Act and/or NC Act were listed in the HERBRECS database search (Queensland Herbarium, 2015) (**Appendix C**) as occurring within the locality are presented in **Table 4.5**.

Table 4.5 Threatened Flora Species HERBRECS Database Results

Scientific Name	Common Name	Status[1]	
		EPBC Act	NC Act
Ammannia robertsii	-	-	E
Eriocaulon carsonii	Salt Pipwort	E	E
Eryngium fontanum	Blue Devil	E	E
Hydrocotyle dipleura	-	-	V
Lawrencia buchananensis	-	V	V
Livistona lanuginosa	Waxy Cabbage Palm	V	V
Myriophyllum artesium	-	-	E
Sporobolus pamelae	-	-	E

[1] Threatened flora species status under the EPBC Act and/or NC Act (current at 6 March 2015).
E = Endangered; V = Vulnerable

4.1.6 Map of Referrable Wetlands

The map of referable wetlands shows that there is one HES wetland (with an associated 500 m trigger area) and a GES wetland located in the north of the study area (**Figure 8**). The HES wetland is described in more detail in **Section 4.2.2** and is described in detail in the EIS Aquatic Ecology and Stygofauna Report.

4.1.7 Vegetation Management Wetlands Map

The HES wetland described in **Section 4.1.6** is also mapped on the EHP's vegetation management wetlands map. According to the EO Regulation, significant residual impacts on REs that intersect with an area shown as a wetland on the vegetation management wetlands map are required to be offset. This wetland has been mapped by the Queensland government as RE 10.3.15k: *Eucalyptus brownii* open-woodland in closed depressions (**Table 4.2**; **Figure 7**).

4.1.8 Vegetation Management Watercourse Map

In accordance with the EO Regulation, a prescribed RE is a MSES to the extent that the ecosystem is located within a defined distance from the banks of a relevant watercourse. The defined distance is determined by the stream order, with different stream orders requiring larger buffers of vegetation from the bank of the stream. Defined distances are outlined in the QEOP and are:

- Stream Order 1 or 2 – 10 m distance from the defining bank;
- Stream Order 3 or 4 – 25 m distance from the defining bank; and
- Stream Order 5 or greater – 50 m distance from the defining bank.

The EHP's vegetation management watercourse map has been overlayed on top of the RE mapping that has been undertaken for the project to determine the areas that are classified as MSES. This is discussed further is **Section 5.2.3**.

4.1.9 Groundwater Dependent Ecosystem Mapping

The Commonwealth government's GDE Toolbox prepared by Richardson *et al.* (2011) defines GDEs as "*Ecosystems that require access to groundwater to meet some or all of their water requirements so as to maintain the communities of plants and animals, ecological processes they support, and ecosystem services they provide*".

The potential for GDEs to occur in the study area was assessed via:

- A search of the Queensland Wetland Data Springs database;
- A search of the BoM's GDE Atlas; and
- Groundwater field investigations.

A search of the Queensland Wetland Data Springs database indicated that no springs are located in the study area.

According to the BoM GDE Atlas, there are several potential GDEs in the study area. It is noted that the GDE Atlas is prepared on a broad scale. It identifies areas that may warrant further investigation for the presence of GDEs, but does not provide a confirmed map of GDEs. GDEs are described further in **Section 4.4**.

4.1.10 Biodiversity Planning Assessments

The EHP has prepared a BPA for the region. This draws on remnant vegetation mapping and database information to characterise areas into one of three biodiversity significance levels:

- State Biodiversity Significance – areas assessed as being significant for biodiversity at the bioregional or state scales;
- Regional Biodiversity Significance – areas assessed as being significant for biodiversity at the sub-bioregional scale; and
- Local Biodiversity Significance and/or other values – local values that are of significance at the local government scale.

BPA mapping for the study area indicates that the entire study area is classified as being of State Biodiversity Significance, and that the majority of the study area, with the exception of the north-east and western corners is also considered to be within a State Biodiversity Corridor (**Figure 9**).

As described above, BPAs are prepared on a broad, landscape scale and are based on Queensland government vegetation mapping. Further field work, and site specific assessment, is required to accurately assess the biodiversity values of an area and its value as a biodiversity corridor. **Section 4.**6 describes the study area's value as a biodiversity corridor (based on site specific fieldwork and mapping). It is noted that the fieldwork has not identified any physical or biodiversity features that align with the boundaries of the BPA State

Biodiversity Corridor mapped within the study area (**Figure 9**). The areas identified in a BPA are not protected under any Queensland legislation.

4.1.11 Essential habitat

Essential habitat is mapped by the EHP, and is defined as:

> *"vegetation in which a species that is endangered, vulnerable, rare or near threatened has been known to occur"*

The EHP uses these essential habitat maps to help determine the habitat status of the vegetation when assessing applications to clear vegetation. No essential habitat has been mapped by the EHP as occurring in the study area.

4.2 Overview of Biodiversity Values of the Study Area

4.2.1 Broad Vegetation

The vegetation and biodiversity patterns in the study area are strongly influenced by the different landforms that are present. The south-eastern part of the study area is characterised by flat to undulating sand plains that support large expanses of savannah woodlands. These sand plains graduate to elevated sandstone ranges to the north and west of the study area that support low Eucalyptus woodlands and shrublands. The elevated areas contain a number of microhabitats including plateaus, talus slopes and cliffs, all of which support different types of vegetation. In the transition zone between the south-eastern sand plains and the western sandstone ranges extensive 'ironstone jump-ups' occur (mesa-like small, flat topped hills covered in ironstone concretions). In the lower sand plains, vegetation along ephemeral drainage lines (riparian vegetation) and on floodplains is underlain by exposed Tertiary material and is characterised by a mosaic of tall woodland types.

The vegetation across the entire study area is considered to comprise remnant vegetation. There is no evidence that there has been previous widespread clearing of vegetation in the study area. Overall the vegetation is in a very good condition although the structure of the understorey and the condition of the ground layer has been modified in many areas by cattle grazing. The study area has been, and continues to be, used for cattle grazing where grasses occur in the woodland understorey. However, the vegetation remains in a natural condition dominated by native plant species and contains relatively low levels of weeds. One Class 2 declared weed, namely Parthenium Weed (*Parthenium hysterophorus)* listed under the LP Act was recorded within the study area. Some limited occurrences of the exotic pasture grass species Buffel Grass (*Cenchrus ciliaris*) were noted in the south-eastern sand plains but this was not extensive. This is a plant well regarded as a pasture plant, but which can be detrimental to biodiversity (Eyre *et al.*, 2009).

Due to the remnant status of the entire study area, and the lack of vegetation clearance, habitat connectivity in the landscape is essentially unbroken throughout the study area. The study area provides linkages with remnant vegetation on all sides that can be utilised by

fauna species to connect to adjacent areas of habitat. The study area provides a range of habitat for fauna species, including ephemeral drainage lines and seasonal wetlands, rocky outcrops and extensive areas of woodland. Although widespread clearing has not occurred, it has been grazed for decades, and this has resulted in a range of impacts related to stock, such as erosion of ephemeral drainage lines through trampling with hooves, nutrient enrichment through cattle manure, and reduction of grass biomass through grazing. However, the level of existing impacts is low and the quality of the habitat has not been significantly altered by human activity.

Much of the study area has been burnt within the last 10 years, which has resulted in a reduction in the amount of woody debris on the ground, and subsequently a reduction in habitat for reptiles in these areas. As a result of fire, dense stands of *Acacia* spp. regrowth has occurred in places, which reduce the quality of the habitat for some species. Many species do not prefer shrubby environments, although these areas may provide suitable habitat for woodland bird species as the shrubby regrowth offers shelter and foraging resources.

The study area contains three broad vegetation associations, namely: sand plains and savannah woodlands; elevated sandstone ranges, plateau margins, talus slopes and ironstone jump-ups; and riparian environments. These broad vegetation associations and their defining characteristics are described in further detail below.

i. Sand Plains and Savannah Woodlands

The south-eastern part of the study area is characterised by sand plains and savannah woodlands (**Figure 10**; **Photographs 4.1** to **4.3**). The main vegetation in this area consists of savannah woodlands that vary in response to the increasing depth of sand deposits from west to east.

The main vegetation found here include RE 10.3.6 and RE 10.3.6a: *Eucalyptus brownii* open-woodland on alluvial plains; RE 10.3.28a: *Eucalyptus melanophloia* open-woodland on sandy alluvial fans; RE 10.5.1a: *Eucalyptus similis* open-woodland on sand plains; 10.5.4: *Eucalyptus crebra* or *Eucalyptus drepanophylla* open woodland on sand plains; and RE 10.5.5a: *Eucalyptus melanophloia* open-woodland on sand plains.



Photograph 4.1: Western part of the sand plains with *Eucalyptus setosa* overstorey and *Hakea* sp. as the sub-dominant tree (or dominant tall shrub)



Photograph 4.2: Tertiary sand plains, with *Eucalyptus brownii*, in the south-east of the study area



Photograph 4.3: Sand plains in the far east of the study area with *Eucalyptus melanophloia* and *Eucalyptus brownii* overstorey

In the western-most extent of the sand plains where the sands are shallowest, low and stunted woodlands occur that are dominated by Inland Yellow Jacket (*Eucalyptus similis*), occasionally Yellowjacket (*Corymbia leichhardtii*) and a diversity of *Acacia* spp.

In the central sand plains, the savannah woodlands are dominated largely by Narrow-leaved Ironbark (*Eucalyptus crebra*) and Silver-leaved Ironbark (*Eucalyptus melanophloia*). The eastern-most extent of the sand plains in the study area where the soils are deepest and most fertile, the savannah woodlands are dominated by Silver-leaved Ironbark, Reid River Box (*Eucalyptus brownii*) and Dallachy's Gum (*Corymbia dallachiana*).

The understorey of the eastern-most savannahs are dominated by a diverse mixture of tall perennial native grasses including Black Speargrass (*Heteropogon contortus*), Kangaroo Grass (*Themeda triandra*) and Wire Grasses (*Aristida* spp.).

Fauna Habitat Values

The south-eastern section of the southern portion of the study area is relatively productive and provides suitable habitat for most of the threatened fauna species known or predicted to occur in the locality of the study area (**Section 4.6**). This includes a diversity of grasses for granivorous species and taller Eucalyptus trees for larger animals. The eastern and southern portion of the study area provides diverse savannah grasslands and standing water in the wet season for granivores and they also provide the most suitable habitat for predatory species dependant on amphibians.

ii. Elevated Sandstone Ranges, Plateau Margins, Talus Slopes and Ironstone Jump-ups

The elevated sandstone ranges, plateau margins, talus slopes and ironstone jump-ups occur below cliff lines in the western portion of the study area (**Figure 10**). These areas support low open woodlands on thin sandy soils that are dominated by a combination of Lancewood, Fine-leaved Ironbark (*Eucalyptus exilipes*) and Yellowjacket.

The dominant vegetation found here include RE 10.5.1a: *Eucalyptus similis* open-woodland on sand plains; RE10.7.3c: *Corymbia lamprophylla* and/or *C. leichhardtii* open-woodland on ferricrete above scarps; RE10.10.1a: *Acacia shirleyi* woodland on sandstone ranges; RE 10.10.3: *Eucalyptus drepanophylla* open-woodland on sandstone ranges; RE10.10.4a: *Corymbia leichhardtii* open-woodland on sandstone ranges; and RE 10.10.4c: *Eucalyptus similis* open-woodland on sandstone ranges.

Narrow-leaved Ironbark is an occasional dominant species in areas that occur near gully lines or in slight depressions where there are deeper soils. The understorey is variable and can be shrubby, grassy or stony. Soft Spinifex (*Triodia pungens*), *Cleistochloa subjuncea* and/or Razor Grass (*Scleria sphacelata*) typically dominate the understorey where it is grassy. Examples of these habitats are shown in **Photographs 4.4, 4.5 and 4.6**.

Ironstone jump-ups are small, flat topped hills covered in ironstone concretions. As ironstone is a hard rock, ironstone jump-ups in the study area would have formed as the softer surrounding bedrock of the elevated rangeland eroded away. As such, they are typically found just to the east of the sandstone cliff-lines in a narrow band. They retain little vegetation as much of the soil profile has largely been eroded away, but the vegetation that does occur is similar to that in the woodlands on the sandstone ranges (**Photograph 4.6**).



Photograph 4.4: At bottom of cliff line on talus slopes – dominated by Lancewood with Spinifex, *Scleria sphacelata* and *Cleistochloa subjuncea* understorey



Photograph 4.5: Plateau top dominated by *Acacia shirleyi* with *Triodia pungens* understorey



Photograph 4.6: Ironstone jump-up (foreground) in the study area

Fauna Habitat Values

The upland areas provide high quality habitat for nectarivorous birds due to abundant flowering shrubs such as *Grevillea* spp. and reptiles due to shelter habitat in the form of rocky outcrops, rock slabs, cracks and crevices. Remnant pools are present along the ephemeral drainage lines and are an important water source for birds in these areas, particularly during the dry season when water sources contract to remnant pools that are highly important as refuge habitat.

The sandstone escarpments contain crevices that are likely to provide good habitat for cave-dependant microbats (although no caves were observed and the area would not provide habitat for colonies of some bat species). Tree hollows are scarce in the uplands, and this is likely to limit the value of habitats in this area for arboreal mammals such as gliders and possums.

A range of native grasses are present in the understorey which would provide an important food source for granivorous birds such as the Black-throated Finch (white-rumped subspecies) and the Squatter Pigeon (southern subspecies).

iii. Riparian Environments

Riparian environments within the study area comprise vegetation along ephemeral drainage lines (riparian vegetation) and adjacent areas and are characterised by a mosaic of tall woodland types (**Figure 10**). The EIS Groundwater Report has confirmed that there is no groundwater associated with these environments.

Vegetation recorded from these areas include RE 10.3.14d: *Eucalyptus camaldulensis* with or without *Corymbia leichhardtii* open-woodland along watercourses. Dominant trees are typically River Red Gum (*Eucalyptus camaldulensis*), Forest Red Gum (or possible intergrades of the two canopy species (**Photograph 4.7**). Co-dominant or sub-dominant canopy species include Dallachy's Gum, Yellowjacket and various *Acacia* spp. The understorey is grassy and is dominated by a wide variety of grasses including *Heteropogon contortus*, *Themeda triandra* and *Aristida* spp.



Photograph 4.7: Riparian Vegetation in the Study Area

Fauna Habitat Values

The riparian environments mapped within the study area are important habitats as they provide forage and shelter habitat in proximity to a water source. This combination is very important for a range of species, in particular birds that require this combination in order to breed successfully. The remnant pools that form in the ephemeral drainage lines are an important resource for fauna in the study area, in particular for birds such as finches that need to drink daily. The few remnant pools that remain in the dry season are crucial refuges for a wide range of species during dry conditions when water is scarce. Riparian environments are also important habitat for the Koala as they contain preferred Red Gum species (i.e. *Eucalyptus camalduensis* and *E. tereticornis*) for foraging, and these areas are known to provide refuge habitat for this species during times of drought.

4.2.2 Aquatic Habitats

Aquatic ecology is described in detail in the EIS Aquatic Ecology and Stygofauna Report. The report explains in detail the habitats present within the study area and the ecological values that were recorded during surveys within these habitats.

The study area comprises three different aquatic habitat types, namely naturally occurring ephemeral drainage lines; seasonal wetlands; and artificial farm dams (**Figure 10**). No permanently flowing waterway or artesian springs or bores occur in the study area, and all of the drainage lines that occur are ephemeral and dependent on seasonal rainfall. These originate in the higher altitude areas to the west of the study area and flow eastwards towards lower, flatter land (**Figure 10**).

i. Fauna Habitat Values

During the wet season, the seasonal wetlands (**Figure 10**) contain water and provide a range of habitats such as woody debris, standing trees, macrophytes and fringing vegetation such as reeds and rushes. They are likely to provide suitable habitat for a range of amphibians and waterbirds, including migratory wetland birds with potential to occur in the locality. However, these seasonal wetlands were dry during the October 2012 and October 2013 field surveys. For this reason, the importance of these areas as wetland habitat is limited due to their impermanence.

The two farm dams (**Figure 10**) contained water during both the October 2012 and October 2013 field surveys and are likely to be relatively permanent. Accordingly, they provide an important water resource for fauna utilising surrounding vegetated habitats.

4.2.3 Geology and Soils within the Study Area

The study area is located on the eastern margin of the Galilee geological basin. Darkies Range represents the easternmost extent of the Clematis Sandstone and underlying Rewan Formation sediments. East of Darkies Range, the Clematis Sandstone and Rewan Formation sediments are absent. In this area, sedimentary sequences of the Betts Creek Beds coal measures and underlying Joe Joe Group are overlain by a blanket of Tertiary sediments. More recent deposits comprise thin gravels and muds localised within present day drainage lines.

The study area is dominated by hard laterite and gravelly soils along the ridge lines of Darkies Range, and loamy earths in the north-eastern areas of the study area moving towards sandy earths in the south. Large areas of silty loams dominate the central areas of the study area, and the plateau of Darkies Range in the north. Sandy loam earths and silty clays are found along the drainage lines in the eastern portion of the study area.

4.3 Regional Ecosystems

4.3.1 Introduction

RE mapping of the study area has been undertaken based on existing Queensland government RE mapping. This mapping was ground-truthed during the field surveys and was found to be relatively accurate. There are 32 REs within the study area (**Table 4.5**) (**Figure 11**). Most polygons shown on **Figure 11** contain mixed vegetation communities.

The ground-truthed RE mapping has been overlayed on the existing Queensland government RE mapping within the study area to show the differences between the two maps (**Figure 12**). Although there is a difference between the two maps (**Figure 12**), this does not have any implications for impact assessment. This is because the REs affected by the discrepancy in the mapping are all classified as Least Concern under the VM Act and have similar habitat values.

Table 4.6 provides an overview of all REs recorded. **Appendix I** contains a full description and profile of each RE and each vegetation community within each RE that has been identified. The area of each RE within the study area is shown in **Table 4.6**. The majority of the REs recorded within the study area have a low representation in the protected area estate, as defined in the REDD.

Table 4.6 Regional Ecosystems Present in the Study Area

RE Code	Description[1]	Conservation Status			Area within the Study Area (ha)
		EPBC Act[2]	VM Act[3]	Biodiversity Status[3]	
10.3.6	*Eucalyptus brownii* open-woodland on alluvial plains	-	Least Concern	No concern at present	1,628
10.3.6a	*Eucalyptus brownii* open-woodland on alluvial plains	-	Least Concern	No concern at present	450.8
10.3.10	*Corymbia dallachiana* and *C. terminalis* open-woodland on old alluvial plains (western)	-	Least Concern	No concern at present	13.8
10.3.11a	*Corymbia leichhardtii* woodland on alluvium in valleys	-	Least Concern	No concern at present	234.8
10.3.14	*Eucalyptus camaldulensis* and/or *E. coolibah* open-woodland along channels and on floodplains	-	Least Concern	Of Concern	28.6
10.3.14c	Sandy river beds	-	Least Concern	Of Concern	0.5
10.3.14d	*Eucalyptus camaldulensis* with or without *Corymbia leichhardtii* open-woodland along watercourses	-	Least Concern	Of Concern	70.8
10.3.15k	*Eucalyptus brownii* open-woodland in closed depressions	-	Least Concern	Of Concern	123.2
10.3.16d	Ephemeral lakes with sparse-herbland or sparse-tussock grassland	-	Least Concern	Endangered	31.4
10.3.28a	*Eucalyptus melanophloia* open-woodland on sandy alluvial fans	-	Least Concern	No concern at present	1,737.8
10.5.1a	*Eucalyptus similis* open-woodland on sand plains	-	Least Concern	No concern at present	4,302.6
10.5.1c	*Eucalyptus similis* and *Corymbia setosa* low open-woodland on sand plains	-	Least Concern	No concern at present	195
10.5.1d	*Corymbia setosa* low open-woodland on sand plains	-	Least Concern	No concern at present	70.3
10.5.4	*Eucalyptus crebra* or *E. drepanophylla* open woodland on sand plains	-	Least Concern	No concern at present	1,483.1
10.5.4b	*Eucalyptus crebra* open-woodland on sand plains	-	Least Concern	No concern at present	120.8
10.5.5a	*Eucalyptus melanophloia* open-woodland on sand plains	-	Least Concern	No concern at present	3,419.4
10.5.10	*Corymbia leichhardtii* open-woodland on sand plains	-	Least Concern	No concern at present	134.8
10.7.2a	*Eucalyptus persistens* low open-woodland with soft spinifex on ferricrete above scarps	-	Least Concern	No concern at present	84.8
10.7.3a	*Acacia catenulata* low woodland on scarps	-	Least Concern	No concern at present	32.1
10.7.3b	*Acacia shirleyi* woodland on scarps	-	Least Concern	No concern at present	99.5

RE Code	Description[1]	Conservation Status			Area within the Study Area (ha)
		EPBC Act[2]	VM Act[3]	Biodiversity Status[3]	
10.7.3c	*Corymbia lamprophylla* and/or *C. leichhardtii* open-woodland on ferricrete above scarps	-	Least Concern	No concern at present	863.1
10.7.4	*Eucalyptus persistens* low open-woodland on pediments below scarps	-	Least Concern	No concern at present	5.4
10.7.5	*Eucalyptus thozetiana* open-woodland on scarps and on pediments below scarps	-	Least Concern	Of Concern	2.6
10.7.7b	*Melaleuca tamariscina* low open-woodland on ferricrete	-	Least Concern	No concern at present	38.9
10.7.11a	*Eucalyptus melanophloia* low open-woodland on ferricrete	-	Least Concern	No concern at present	83
10.7.12a	*Eucalyptus drepanophylla* open-woodland on ferricrete	-	Least Concern	No concern at present	675.7
10.10.1a	*Acacia shirleyi* woodland on sandstone ranges	-	Least Concern	No concern at present	1,636.7
10.10.1b	*Acacia catenulata* low woodland on sandstone ranges	-	Least Concern	No concern at present	8
10.10.3	*Eucalyptus drepanophylla* open-woodland on sandstone ranges	-	Of Concern	Of Concern	270.5
10.10.4a	*Corymbia leichhardtii* open-woodland on sandstone ranges	-	Least Concern	No concern at present	1,297.2
10.10.4c	*Eucalyptus similis* open-woodland on sandstone ranges	-	Least Concern	No concern at present	932.7
10.10.5a	*Corymbia trachyphloia* usually with *C. lamprophylla* open-woodland on sandstone ranges	-	Least Concern	No concern at present	12.1
				TOTAL (ha)*	**20,087.9**

1 DSITIA (2012) *Regional Ecosystems Technical Description of the Desert Uplands.*

2 TEC Status under the EPBC Act (current at 6 March 2015).

3 Threatened RE status and Biodiversity Status under the VM Act (current at 6 March 2015).

* In some cases totals may not equal the appropriate total number due to rounding.

4.3.2 EPBC Act Listed Communities

No TECs as defined under the EPBC Act were recorded during the field survey or from the EPBC Act Protected Matters Search (**Appendix A**), and none are considered likely to occur.

4.3.3 VM Act Listed Communities

The majority of the vegetation communities in the study area are listed as Least Concern under the VM Act, however one vegetation community listed as Of Concern occurs in the study area: RE 10.10.3: *Eucalyptus drepanophylla* open woodland on sandstone ranges (**Table 4.6**).

No communities listed as Endangered under the VM Act were recorded in the study area (**Table 4.6**).

Approximately 270.5 ha of RE 10.10.3 occurs in the study area, located mostly to the central-west and north-west (**Table 4.6**; **Figures 11** and **13**). All of this community occurs in heterogeneous polygons, which contain more than one RE. Mixed polygons occur where it is not possible to spatially delineate each community into homogenous polygons.

RE 10.10.3 is described in more detail below.

i. RE 10.10.3: Eucalyptus drepanophylla open woodland on sandstone ranges

a. RE Overview

This community comprises an open-woodland dominated by Narrow-leafed Ironbark, a tree which dominates the very sparse canopy (15 – 18 m tall), and sometimes Yellowjacket. *Petalostigma banksii* often dominates the shrub layer (1.5 -3.0 m tall). *Jacksonia ramosissima* is usually abundant. The ground layer is very sparse and dominated by species including *Eriachne mucronata*, *Schizachyrium fragile* and *Triodia pungens.* Other grasses present are *Abildgaardia ovata, Aristida holathera* var. *holathera*, *Eragrostis sororia*, *Heteropogon contortus* and *Themeda triandra*. Forbs (non-grass understorey herbs) frequently present are *Brunoniella australis*, *Chrysocephalum apiculatum*, *Cyanthillium cinereum*, *Phyllanthus virgatus* and *Rostellularia adscendens*. This community occurs on slopes of rocky hills with skeletal soils to shallow sandy earths, often gravelly, on sandstone ranges (DSITIA, 2012).

b. Presence and Habitat in the Study Area

This community occurs in the northern portion of the study area as well as within the western section of the central portion of the study area (**Figure 11** and **13**). This RE type was recorded within the higher elevation sandstone ranges in the study area.

4.4 Groundwater Dependent Ecosystems

4.4.1 Groundwater Setting

The regional geology within the vicinity of the study area broadly comprises the following strata:

- A veneer of highly weathered Tertiary sediments and localised Quaternary sediments;
- Triassic sediments of the Clematis Sandstone, Moolayember Formation and Rewan Formation;
- Permian Betts Creek Beds including coal seams; and
- Underlying sediments of the Joe Joe Group.

The EIS Groundwater Report provides cross-sections illustrating the distribution of these strata across the study area and surrounding area.

The superficial deposits of the Tertiary and Quaternary sediments are the key strata of relevance to the assessment of shallow groundwater and potential GDEs. The distribution and hydrogeology of these stratigraphic units is described in detail in the following sections. The hydrogeology of the underlying strata is also summarised.

i. Quaternary Sediments

Regional geological mapping indicates the presence of fluvial sediments associated with present day drainage features. The distribution of these sediments in the vicinity of the study area was further investigated through targeted groundwater drilling and stream geomorphology assessments. These assessments are discussed in the EIS Groundwater Report and the EIS Surface Water Section, respectively.

These studies confirmed that the minor drainage lines and overland flowpaths present within the study area and downstream catchment are characterised by rock channels or exposed Tertiary materials. Extensive, deep alluvial deposits and associated shallow groundwater are therefore absent from the study area and surrounding area. Quaternary sediments present in the vicinity of the study area are limited to thin (less than 1 m) patches of mud and gravel that dry quickly following flow events. The absence of shallow groundwater is further evidenced by the lack of bores in the vicinity of the study area.

This contrasts with the extensive Quaternary sediments associated with the regionally significant Belyando and Carmichael River systems. These alluvial deposits are recharged by direct rainfall to large catchments and seepage from major rivers during periods of surface flow. These alluvial deposits are known to support a perennial water table and exhibit high yields and permeability. The Belyando River alluvium is located 40 km downstream of the study area and the Carmichael River alluvium is located in a separate catchment from the study area.

ii. Tertiary Sediments

The Tertiary sediments comprise claystone and weakly indurated sandstone and siltstone. This unit is a highly weathered, low to moderate permeability detrital deposit that covers much of the low-lying areas either side of the Darkies Range ridgeline. These sediments typically increase in thickness with distance from Darkies Range and within the study area range from zero to 60 m. The Tertiary sediments are thin or absent on the elevated ridge of Darkies Range.

In elevated areas, recharge is diffuse and limited to sporadic rainfall events over small catchment areas. As a result of the limited recharge, the localised Tertiary sediments along Darkies Range are dry and unsaturated. In the lower lying areas beyond Darkies Range, recharge is expected to be enhanced as the topography transitions from the sloping ridge to flatter plains, and the diffuse rainfall catchment area increases.

A water table forms within these sediments in the south-east of the study area and extends east towards the Belyando River. The hydraulic gradient of this groundwater body is also to the east, reflecting the regional topography and surface water catchment setting. Where present within the study area the water table is generally deep (25 to 55 m below ground level) and disconnected from local surface drainage features. Further east of the study area, the water table is typically 15 to 20 m below North Creek and 20 to 25 m below Tomahawk Creek. Groundwater from this unit is likely to discharge to the Belyando River.

Tertiary sediments are present within the Lake Buchannan drainage basin to the west of Darkies Range. These sediments are discontinuous with the Tertiary sediments east of Darkies Range. The Tertiary sediments underlying Lake Buchannan host a shallow water table that is a regional discharge point for groundwater from underlying units. Only a minor section of the northern project site is within this catchment.

iii. Other Strata

The elevated ridgeline of Darkies Range comprises the Clematis Sandstone and underlying Rewan Formation. These formations are generally exposed along the ridgeline and slopes with limited cover. In this area, the water table is typically greater than 100 m below ground level. No shallow groundwater is present in this area.

In the low-lying areas west of the Darkies Range ridgeline, groundwater is generally confined by the Moolayember Formation and overlying Tertiary sediments. Groundwater movement is towards Lake Buchannan which is likely to act as an area of limited groundwater discharge. In this area, shallow groundwater will discharge through superficial Tertiary sediments from the underlying Moolayember Formation and Clematis Sandstone, as discussed in the previous section.

East of Darkies Range, the older Betts Creek Beds and underlying Joe Joe Group subcrop beneath the Tertiary sediments. Where the Tertiary sediments are dry within the vicinity of the study area, groundwater will rest at greater depth within the underlying Betts Creek Beds and Joe Joe Group.

4.4.2 Potential for Groundwater Dependent Ecosystems to Occur in the Study Area

As indicated in **Section 4.4.1**, there is no shallow groundwater within the study area. In the elevated Darkies Range ridgeline, groundwater is typically more than 100 m below ground level. In low lying areas, east of Darkies Range, the groundwater table is at least 25 m below ground level and disconnected from surface water features.

The vegetation survey and mapping that has been undertaken has not identified any areas of vegetation that would appear to be dependent on groundwater. Consequently, BoM's GDE mapping of the study area (**Section 4.1.9**) does not appear to be consistent with the hydrogeological setting of the study area or the flora and fauna field survey results. It is concluded that there are no GDEs within the study area.

4.4.3 Doongmabulla Springs Complex

The nearest GDE to the study area is the Doongmabulla Springs Complex (**Figure 3**), a cluster of 11 springs, located within a 4 km radius of each other, along the Carmichael River. The Doongmabulla Springs Complex (**Figure 3**) supports vegetation that forms part of the "community of native species dependent on natural discharge of groundwater from the Great Artesian Basin TEC". This community is listed as Endangered under the EPBC Act.

The Doongmabulla Springs Complex is located approximately 22 km south of the southern boundary of the study area (**Figure 3**). This springs complex is also the closest groundwater spring to the study area. This TEC was relevant to the CCM&RP because the EIS for this project concluded that the proposed Carmichael Coal Mine, which will be located 8 km to the east of the TEC, would result in a reduction in groundwater pressure at the springs.

The Clematis Sandstone is the source aquifer for the Doongmabulla Springs Complex. The study area is located at the eastern margins of the Clematis Sandstone where this unit is largely dry and unsaturated. In the south of the study area, closest to the Doongmabulla Springs Complex, the Clematis Sandstone is generally absent. In this area, open cut mining and subsidence cracking above the Southern Underground will not intersect the Clematis Sandstone. The only mechanism by which the project could potentially impact on the springs would be via depressurisation of the underlying low permeability Betts Creek Beds and Rewan Formation in the south of the study area propagating upwards to the Clematis Sandstone and laterally 22 km to the springs. The maximum predicted extent of depressurisation in the Clematis Sandstone extends up to 10 km from the study area. This means that no significant depressurisation of the Clematis Sandstone due to the project will occur within 12 km from the Doongmabulla Spring Complex during or post mining and therefore no impacts on the springs or associated vegetation are predicted.

4.5 Flora Species

The study area is relatively diverse in terms of floristic diversity, and a total of 311 flora species were recorded during the field surveys. This included 302 (97%) native species and 9 (3%) exotic species representing 62 families and 172 genera. The dominant family groups included Poaceae (containing 64 species), Fabaceae (containing 36 species), Myrtaceae (containing 30 species) and Mimosaceae (containing 23 species). The most represented genera of plants were *Acacia* spp. and *Eucalyptus* spp., with 22 and 12 species recorded, respectively.

A full list of the flora species recorded from the study area is presented in **Appendix J**.

No threatened flora species were recorded during the surveys. Threatened flora species listed under the EPBC Act and NC Act that were recorded the database searches (**Appendices A** to **C**) are discussed in **Sections 4.5.1** to **4.5.2**, respectively.

One Class 2 Declared Weed species listed under the LP Act was recorded within the study area, namely, Parthenium Weed (**Appendix J**). No Class 1 or Class 3 Declared Weeds were recorded.

4.5.1 Threatened Flora Species Listed under the EPBC Act

A total of four threatened flora species listed under the EPBC Act were listed in the Queensland Wildlife Online database search (**Appendix B**) as being recorded from the locality. As noted previously in **Section 4.1.1**, no threatened flora species were predicted to occur in the study area in the EPBC Act Protected Matters Search Tool Report (**Appendix A**).

Table 4.7 provides a summary of the threatened flora species listed under the EPBC Act that were listed in the Queensland Wildlife Online database search (**Appendix B**) as being recorded from the locality and an assessment of their potential to occur within the study area. Note that there were no additional EPBC Act listed threatened species, beyond those listed in **Table 4.6**, recorded or assessed a having a high or moderate potential to occur at the proposed Carmichael Coal Mine site.

Table 4.7 EPBC Act Listed Threatened Flora Species Recorded in the Queensland Wildlife Online Database

Scientific Name	Common Name	EPBC Act Status[1]	Potential to Occur within the Study Area
Eriocaulon carsonii	Salt Pipwort	Endangered	Low
Eryngium fontanum	Blue Devil	Endangered	Low
Lawrencia buchananensis	-	Vulnerable	Low
Livistona lanuginosa	Waxy Cabbage Palm	Vulnerable	Low

[1] Threatened flora species status under the EPBC Act (current at 6 March 2015).

No threatened flora species listed under the EPBC Act were recorded from the study area.

The Salt Pipwort (*Eriocaulon carsonii*) and Blue Devil (*Eryngium fontanum*) are restricted to springs. There are no springs present within the study area (**Section 4.2.3**) and the study area provides no suitable habitat for these species. The records in the Queensland Wildlife Online database are most likely from the Doongmabulla Springs Complex, which is located approximately 21 km south of the study area. As such, these species are not considered further in this report.

The threatened flora species, *Lawrencia buchananensis,* listed as Vulnerable under the EPBC Act was recorded from the locality by the Queensland Wildlife Online database (**Appendix B**). In addition, one species listed as Vulnerable under the NC Act and the EPBC Act has been recorded from the locality by the Queensland Wildlife Online database (**Appendix B**) and the proposed Carmichael Coal Mine site, namely the Waxy Cabbage Palm (*Livistona lanuginosa*). An assessment of the potential of these species to occur within the study area was undertaken and concluded that there is a low potential of these species occurring. The full assessment is presented in **Appendix H**.

4.5.2 Threatened Flora Species Recorded under the NC Act

No threatened flora species listed under the NC Act were recorded from the study area. However, eight threatened flora species were listed in the Queensland Wildlife Online database search (**Appendix B**) and HERBRECs database search (**Appendix C**) as being recorded within the locality and are listed in **Table 4.8**.

Table 4.8 provides a summary of the threatened flora species listed under the NC Act that were listed in the Queensland Wildlife Online database (**Appendix B**) and HERBRECs database search (**Appendix C**) as being recorded within the locality and an assessment of their potential to occur within the study area. Note that there were no additional NC Act listed threatened species, beyond those listed in **Table 4.8**, recorded or assessed a having a high potential to occur at the proposed Carmichael Coal Mine site.

Table 4.8 NC Act Listed Threatened Flora Species Recorded in the Queensland Wildlife Online Database

Scientific Name	Common Name	NC Act Status[1]	Potential to Occur within the Study Area
Ammannia robertsii	-	Endangered	Low
Eriocaulon carsonii	Salt Pipwort	Endangered	Low
Eryngium fontanum	Blue Devil	Endangered	Low
Hydrocotyle dipleura	-	Vulnerable	Low
Lawrencia buchananensis	-	Vulnerable	Low
Livistona lanuginosa	Waxy Cabbage Palm	Vulnerable	Low
Myriophyllum artesium	-	Endangered	Low
Sporobolus pamelae	-	Endangered	Low

[1] Threatened flora species status under the NC Act (current at 6 March 2015).

The Salt Pipwort, Blue Devil, *Lawrencia buchananensis* and Waxy Cabbage Palm are also listed under the EPBC Act and have been considered previously in **Section 4.5.1**.

Habitats in which *Ammannia robertsii* is known from include: woodland with Gidgee (*Acacia cambagei*) on grey cracking clay or alluvial clay plain and open woodland of Brigalow (*Acacia harpophylla*) on clayey alluvial soil with Gilgai containing water (CHAH, 2015). There are no such habitats present within the study area and the study area provides no suitable habitat for this species. As such, this species is not discussed further in this report.

Hydrocotyle dipleura has a highly specialised habitat. It grows on the flat dried-out margins of artesian springs in highly saline sands or clay soils, while *Myriophyllum artesium* and *Sporobolus pamelae* are restricted to springs (EHP, 2014b; EHP, 2014e). There are no springs present within the study area (**Section 4.2.3**) and the study area provides no suitable habitat for these species. These records are most likely from Doongmabulla Springs Complex, which are located approximately 21 km south of the study area. As such, these species are not considered further in this report.

The study area does not contain any areas of critical habitat for flora species within the meaning of the NC Act.

4.6 Fauna Diversity

A total of 190 fauna species (including 182 native species and eight introduced species) have been recorded within the study area comprising eight amphibians (including seven native and one introduced species), 22 reptiles, 128 birds and 32 mammals (including 25 native species and seven introduced species).

The faunal diversity recorded from the study area is described in **Sections 4.6.1** to **4.6.5**. A complete list of fauna species recorded during the surveys within the study area is provided in **Appendix K**.

Sections 4.6.6 to **4.6.9** discuss threatened and/or migratory species listed under the EPBC Act, NC Act and Special Least Concern species listed under the NC Act.

4.6.1 Amphibians and Reptiles

A total of eight amphibian species (comprising seven native and one introduced species) were recorded within the study area (**Appendix K**). Amphibians were reasonably diverse and abundant in suitable areas of habitat given the ephemeral nature of seasonal wetlands and drainage lines at the study area. Species consisted mainly of adaptable frogs such as burrowing frogs (e.g. Ornate Burrowing Frog [*Platyplectrum ornatum*]) (**Appendix K**) that remain dormant during dry conditions and breed in eruptive patterns during wet conditions. Other amphibian species recorded included Spotted Grass Frog (*Limnodynastes tasmaniensis*), Green Tree Frog (*Litoria caerulea*) and Roth's Tree Frog (*Litoria rothii*) (**Appendix K**). No threatened amphibians have been recorded from the locality or the study area and none are considered likely to occur (**Appendix K**).

Exotic Cane Toads (*Rhinella marinus*) occurred throughout the study area (**Appendix K**), and these are known to have the potential to impact negatively on native species that use them as a food source, such as frog-feeding snakes. That notwithstanding, along the margins of some of the ephemeral drainage lines, numerous Cane Toads were recorded that had been turned over and eaten from the underside, which suggests that local fauna are learning how to avoid the toxins on their back and to use them as a food source. The predators responsible could include Water Rats (*Hydromys chrysogaster*) and Torresian Crows (*Corvus orru*).

A total of 22 native reptile species were recorded within the study area (**Appendix K**) despite the relatively cool conditions experienced during the May 2012 surveys. Reptiles recorded consisted of common, widespread species including geckoes such as the Eastern Stone Gecko (*Diplodactylus vittatus*) and Prickly Knob-tailed Gecko (*Nephrurus asper*); and dragons such as the Tommy Roundhead Dragon (*Diporiphora australis*) and Central Netted Dragon (*Ctenophorus nuchalis*) (**Appendix K**). Four snake species were recorded, namely the: Red-naped Snake (*Furina diadema*), Common Death Adder (*Acanthophis antarcticus*), Green Tree Snake (*Dendrelaphis punctulata*) and Australian Coral Snake (*Brachyurophis australis*) (**Appendix K**).

No threatened reptile species were recorded within the study area. The Common Death Adder (*Acanthophis antarcticus*) is listed as Near Threatened under the NC Act and was recorded from one location in the central part of the study area.

4.6.2 Birds

A total of 128 native bird species were recorded within the study area and the avian fauna was generally diverse and abundant during all three survey periods (**Appendix K**). Suitable foraging habitats and remnant pools were present for granivores, insectivores and nectarivores; however predatory birds were comparatively scarce at the study area. This may be a result of the relatively depauperate small mammal population present at the study area.

The majority of the bird species recorded were common, widespread species, however two threatened bird species were recorded, namely the: Black-throated Finch (white-rumped subspecies), listed as Endangered under the EPBC Act and NC Act, and Squatter Pigeon (southern subspecies), listed as Vulnerable under the EPBC Act and NC Act.

Of the bird species recorded from the study area or assessed to have potential to occur, the Australian Painted Snipe and the Black-throated Finch (white-rumped subspecies) are listed as a priority species under the Back on Track framework. The Black-throated Finch (white-rumped subspecies) and the Australian Painted Snipe are considered to have a Back on Track rank of 'High' according to the EHP.

The threatened and/or migratory bird species recorded from the study area and those with potential to occur are considered in more detail in **Sections 4.6.6** to **4.6.8**.

4.6.3 Non-flying Mammals

A total of 17 non-flying mammals, comprising 10 native and seven introduced species, were recorded within the study area (**Appendix K**). A relatively low diversity of non-flying mammals was recorded during the field surveys, and the majority of species were common and widespread, including domestic animals and feral animals. Two common native arboreal mammals, the Sugar Glider (*Petaurus breviceps*) and Common Brushtail Possum (*Trichosurus vulpecula*), were observed during one survey, however these were relatively scarce and restricted to riparian habitats (**Appendix K**). One threatened arboreal mammal species was recorded, the Koala (**Appendix K; Figure 14**), which is listed as Vulnerable under the EPBC Act and Special Least Concern under the NC Act. This species is considered in more detail in **Section 4.6.6**.

One small native terrestrial mammals was detected during surveys, the Water Rat (**Appendix K**). Only one mammal species; the exotic House Mouse (*Mus musculus*) was captured throughout the trapping program, indicating that even introduced and adaptable species are scarce in the study area. A native Water Rat was recorded by one of the IR cameras, in a generic fauna survey site close to an ephemeral drainage line (**Appendix K**). This is a common, widespread species in these kinds of environments. Signs of its presence were recorded at other locations, including feeding areas that contain traces of crustacean and Cane Toad prey. Macropods were relatively abundant in the study area and a number of species were observed during surveys, including the Red Kangaroo (*Macropus rufus*), Euro (*Macropus robustus*) and Swamp Wallaby (*Wallabia bicolor*) (**Appendix K**).

Larger predatory mammals in the study area were restricted to introduced species such as the Domestic Cat (*Felix cattus*) and Domestic Dog/Dingo (*Canis familiaris*) (**Appendix K**).

The study area is currently grazed by European Cattle (*Bos taurus*) which cause land degradation through the creation of access pathways through the vegetation and by eroding the banks of ephemeral drainage lines. Other exotic animals recorded included the European Rabbit (*Oryctolagus cuniculus*) and Feral Pig (*Sus scrofa*) (**Appendix K**). Feral Pigs cause damage to wetland habitats during wet conditions and numerous pig wallows were observed during the field survey.

4.6.4 Bats

The study area supports an abundance and diversity of micro-chiropteran (insectivorous) bats (microbats) with at least 13 microbat species were recorded during the field survey (**Appendix K**).

One species recorded, *Nyctophilus* sp., could not be identified to species level (**Appendix K**). In addition to microbats recorded, the Little Red Flying-fox (*Pteropus scapulatus*) was also recorded during the surveys (**Appendix K**).

Large areas of foraging habitat for microbats are present in the study area including standing water in the form of artificial dams and remnant pools along ephemeral drainage lines, and shelter in the form of tree hollows and crevices. The north-western section of the study area provides more suitable shelter habitat for cave-dependant bats in the form of cracks and

crevices within the sandstone outcrops. All areas of the study area would support shelter for hollow-dependant species. Cave-dependant species are likely to also drink and forage over low-lying flat areas adjacent to the rocky ridges.

None of the bat species recorded from the study area are listed as threatened under the EPBC Act or NC Act, and no bat species listed under the EPBC Act or NC Act are considered likely to occur.

4.6.5 Feral Animals

There are three classes of declared animals under the LP Act. These animals are targeted for control as they represent a threat to primary industries, natural resources and the environment. The definitions of each class are described in **Section 2.4**.

No Class 1 or Class 3 Declared Animals have been recorded in the study area.

Four Class 2 Declared Animals were recorded from the study area including the: Dingo, Feral Cat, Feral Pig, and European Rabbit (**Appendix K**). Other feral animals recorded from the study area include the House Mouse and the Cane Toad (**Appendix K**).

4.6.6 Threatened Fauna Species Recorded under the EPBC Act

Three threatened fauna species listed under the EPBC Act have been recorded from the study area, namely the: Squatter Pigeon (southern subspecies), Black-throated Finch (white-rumped subspecies) and Koala (**Appendix K**; **Figure 14**).

Table 4.9 provides a summary of the threatened fauna species listed under the EPBC Act that were recorded during the surveys or recorded in the databases (**Appendices A** and **B**) as potentially occurring. **Table 4.9** also provides an assessment of their potential to occur within the study area. Note that there were no additional EPBC Act listed threatened species, beyond those listed in **Table 4.9**, recorded or assessed a having a high or moderate potential to occur at the proposed Carmichael Coal Mine site.

Table 4.9 EPBC Act Listed Threatened Fauna Species

Scientific Name	Common Name	EPBC Act Status[1]	Potential to Occur within the Study Area
Reptiles			
Egernia rugosa	Yakka Skink	Vulnerable	Low
Denisonia maculata	Ornamental Snake	Vulnerable	Low
Birds			
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	Vulnerable	Present
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	Endangered	Present

Scientific Name	Common Name	EPBC Act Status[1]	Potential to Occur within the Study Area
Rostratula australis	Australian Painted Snipe	Endangered, Migratory*, Marine*	Moderate
Erythrotriorchis radiatus	Red Goshawk	Vulnerable	Low
Neochmia ruficauda ruficauda	Star Finch (eastern)	Endangered	Low
Mammals			
Phascolarctos cinereus	Koala	Vulnerable	Present
Macrotis lagotis	Greater Bilby	Vulnerable	Low

[1] Threatened, migratory and/or marine species status under the EPBC Act (current at 6 March 2015).

* Species listed as marine and migratory under the EPBC Act as Painted Snipe (*Rostratula benghalensis*) (sensu lato).

The threatened fauna species listed in **Table 4.9** that were recorded within the study area or have been assessed as having a high or moderate potential to occur within the study area are described below. The species listed in **Table 4.9** that have been assessed as having a low potential to occur within the study area are assessed in **Appendix H**.

i. Squatter Pigeon (southern subspecies)

a. Species Overview

The Squatter Pigeon (southern subspecies) is listed as Vulnerable under the EPBC Act and NC Act. This species was recorded during the recent surveys of the study area (**Figure 14**) and was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**), and recorded from the locality in the Queensland Wildlife Online database search (**Appendix B**).

The Squatter Pigeon (southern subspecies) occurs in tropical, open, dry sclerophyll woodlands and savannahs of north-eastern Australia. This species is most often observed in the grassy understorey of Eucalyptus woodlands, close to permanent water bodies. The Squatter Pigeon (southern subspecies) has also been recorded in sown grasslands with scattered remnant trees, disturbed habitats (i.e. around stockyards, along roads and railways, and around settlements), in scrub and Acacia growth. The Squatter Pigeon (southern subspecies) feeds on the seeds of grasses, legumes and other herbs and forbs and sometimes eats fallen seeds from *Acacia* spp. (DotE, 2014l).

The Squatter Pigeon (southern subspecies) was once common and widespread nationally and spread from southern New South Wales to the Burdekin River in northern Queensland. It is now widespread in north and eastern Queensland, with very few recent records from New South Wales (NSW NPWS, 1999). It now occurs on the inland slopes of the Great Dividing Range and its distribution extends from the Burdekin-Lynd divide in central Queensland, west to Charleville and Longreach, east to the coastline between Proserpine and Port Curtis (near Gladstone), and south to scattered sites throughout south-eastern

Queensland (DotE, 2014l) . Across its range it is thought to occur as a continuous, inter-breeding population, with no single populations identified as being important for its long-term survival or recovery (DotE, 2014l) .

The main threats to the Squatter Pigeon (southern subspecies) are the loss and fragmentation of habitat due to clearing, the degradation of habitat by overgrazing by stock, the degradation of habitat by invasive weeds, such as Buffel Grass, and predation by numerous avian and terrestrial predators (DotE, 2014l) .

No habitat critical to the survival of the Squatter Pigeon (southern subspecies) has been nominated under the EPBC Act.

b. Presence in Study Area

The Squatter Pigeon (southern subspecies) was recorded at several locations in the study area (**Figure 14**). It was commonly observed along the tracks while the field survey personnel were driving and many records were adjacent to the artificial farm dams or ephemeral drainage lines (**Figure 14**). This species is tolerant of disturbance and has been recorded from a wide range of habitats. It is considered to be common and widespread in the study area. This species was also recorded at several locations within the proposed Carmichael Coal Mine site, adjacent to the study area (GHD, 2013b).

c. Habitat Modelling

Habitat modelling has been conducted for this species. **Appendix G** contains a full description of the methodology used for habitat modelling. Areas of habitat for this species within and surrounding the study area are presented on **Figures 15** and **16.**

Figure 15 shows that approximately:

- 3,440 ha of high value habitat for this species is present in the northern portion of the study area and along remnant pools in the southern portion of the study area; and
- 16,647 ha of low value habitat for this species is present in the remainder of the study area (i.e. all areas that are not classified as containing high value habitat).

ii. Black-throated Finch (white-rumped subspecies)

a. Species Overview

The Black-throated Finch (white-rumped subspecies) is listed as Endangered under both the EPBC Act and the NC Act. This species was recorded during the recent surveys of the study area (**Figure 14**) and was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**), and recorded from the locality in the Queensland Wildlife Online database search (**Appendix B**).

The Black-throated Finch (white-rumped subspecies) historically occurred from north-east New South Wales to Queensland's Atherton Tablelands and west to central Queensland

(Black-throated Finch Recovery Team, 2007). It appears that the southern subspecies is now confined to the northern part of its former range and analysis of historical records suggests that a contraction of range has been occurring for several decades. Small flocks have been regularly seen scattered throughout the Northern Brigalow Belt and Desert Uplands, suggesting they remain locally common but patchy in these areas. Surveys for the CCM&RP adjacent to the study area have contributed numerous records of this species (GHD, 2014b).

The Black-throated Finch (white-rumped subspecies) occurs mainly in grassy, open woodlands and forests, typically dominated by *Eucalyptus*, *Corymbia* and *Melaleuca* species, and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water (DotE, 2014v). It is dependent on grassy woodland with access to water for regular drinking during the day. It is a sedentary bird, rather than nomadic or migratory, so it requires large areas with a mosaic of different habitats supporting a diversity of seeding grasses to provide feed resources throughout the year, including the wet season (DotE, 2014v).

Black-throated Finches (white-rumped subspecies) are known to breed in colonies, mainly in native vegetation associated with solodic soils and alluvial plains (DotE, 2014v). This kind of vegetation is present in the south-eastern section of the study area and this area may provide suitable breeding habitat for this species. Nests are often built in a hollow branch of a tree, or in a fork in a tree, shrub or sapling and tend to be located close to water (DotE, 2014v). The Black-throated Finch (white-rumped subspecies) is likely to occur in other areas of the study area where similar conditions/habitat are present (i.e. all lower-lying flat grassy woodland areas near a water source, and similar habitats in upland areas in the northern-central portion of the study area).

Threats to the Black-throated Finch (white-rumped subspecies) include cattle grazing and land clearance (Black-throated Finch Recovery Team, 2007). Cattle grazing occurs in the study area, and has the capacity to impact on the Black-throated Finch (white-rumped subspecies) by keeping preferred grass species low and preventing them from seeding and therefore providing food resources for the Black-throated Finch (white-rumped subspecies). Cattle also have a deleterious impact on ephemeral drainage lines, and cattle were recorded during the field surveys as directly competing with the Black-throated Finch for water. This was particularly apparent during the dry season, and in the October 2012 field surveys where small remnant pools were recorded being entirely consumed and trampled by a herd of cattle in the space of several hours, rendering it unsuitable for use by wildlife species such as the Black-throated Finch (white-rumped subspecies).

b. Presence in Study Area

This species was recorded from several locations in the southern portion of the study area (**Figure 14**). A flock of approximately 12 individuals was recorded several times during the first survey period (presumably the same flock). These individuals were observed moving between *Eucalyptus melanophloia*, *Grevillea* spp. and dead saplings. Several individuals and some small flocks were recorded at separate locations during the second and third round of field surveys. This species is considered to be moderately common in the southern part of the study area. This species was also recorded within the southern portion of the

study area during recent surveys undertaken for the CCM&RP. In addition, it was also recorded at several locations within the proposed Carmichael Coal Mine site, adjacent to the study area.

This species is expected to forage and breed within the study area. Foraging habitat includes extensive areas of grassland and grassy woodland where abundant seeding grasses are located in proximity to water. Within the study area this species is likely to feed on grass species such as *Digitaria ciliaris,* Red Natal Grass (*Melinis repens*)*, Paspalidium* spp. and *Setaria surgens.* Nests would be formed using grasses and located within hollow branches, a fork of trees, shrubs and saplings as well as other locations, including within tall grass. Any potential nests within the study area would likely be located in close proximity to water. There are numerous resources available for nesting in proximity to water within the study area, however, these resources are limited due to the ephemeral nature of the water present within the study area.

c. Habitat Modelling

Habitat modelling has been conducted for this species. **Appendix G** contains a full description of the methodology used for habitat modelling. Areas of habitat for this species within and surrounding the study area are presented on **Figures 17** and **18.**

Figure 17 shows that approximately:

- 7,066 ha of high value habitat for this species is present in the northern and southern portions of the study area that contain remnant pools;
- 6,879 ha of low value habitat for this species is present mostly in the southern portion of the study area as well as a few small patches within the northern portion of the study area; and
- 6,143 ha of unsuitable habitat for this species is present within the sandstone escarpments to the north-west and central portions of the study area.

iii. Australian Painted Snipe

a. Species Overview

The Australian Painted Snipe is listed as Endangered under the EPBC Act and Vulnerable under the NC Act and was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**). It is also listed as a migratory and marine species under the EPBC Act (under the name Painted Snipe [*Rostratula benghalensis*]). It has been recorded at wetlands in all states of Australia but it is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland, New South Wales, Victoria and south-eastern South Australia (DotE, 2014w).

The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of Lignum (*Muehlenbeckia* spp.) or Canegrass or

sometimes Tea-trees (*Melaleuca* spp.). The Australian Painted Snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber. The breeding habitat requirements of the Australian Painted Snipe are likely to be quite specific and include shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby (DotE, 2014w).

A number of key threatening processes have been identified for the Australian Painted Snipe. They include habitat loss and degradation associated with drainage and/or diversion of water for agriculture or reservoirs, habitat loss or degradation from trampling by domestic stock, nutrient enrichment and substrate disturbance of aquatic habitat, particularly where cattle are concentrated around wetlands during the dry season, as well as predation by feral animals (DotE, 2014w).

b. Presence in Study Area

This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. It has, however, been assessed as having a moderate potential to occur in the study area based on the presence of suitable habitat in the form of the two seasonal wetlands.

c. Habitat Modelling

Habitat modelling has been conducted for this species. **Appendix G** contains a full description of the methodology used for habitat modelling. Areas of habitat for this species within and surrounding the study area are presented on **Figures 19** and **20.**

Figure 19 shows that approximately:

- 135 ha of high value habitat for this species is present, comprising the two seasonal wetlands in the study area; and
- The remainder of the study area (19,953 ha) (i.e. all areas that are not classified as containing high value habitat) has been classified as unsuitable habitat for this species.

iv. Koala

a. Species Overview

The Koala is listed as Vulnerable under the EPBC Act. This species was recorded during the recent surveys of the study area (**Figure 14**) and this species was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**), and recorded from the locality in the Queensland Wildlife Online database search (**Appendix B**).

Koalas occur in sub-humid woodlands in southern and central Queensland, and in some Eucalyptus woodlands along watercourses in the semi-arid environments of the western part of Queensland (DotE, 2014t). The Koala is known to occur in the Desert Uplands Bioregion, where the study area is located (**Figure 3**). Koalas forage on the leaves of a wide range of *Eucalyptus* spp., however they have distinct preferences for some species over others, with

their preferences varying across their range. Commonly preferred food trees in Queensland are *Eucalyptus* spp. however, it may also consume foliage of related genera, including *Corymbia* spp.*, Angophora* spp. and *Lophostemon* spp. (DotE, 2014t). While Koalas have been observed sitting in or eating up to 120 species of Eucalyptus, the diet of individual Koalas is usually limited to obtaining most of their nutrition from one or a few species present at a site (DotE, 2014t). Species-level preferences may also vary between regions or seasons, and therefore, assessment of habitat quality for Koalas is often based on the identification of local preferences for species and quantification of the availability of those species. A recent study conducted by Melzer *et al*. (2014) studied the habitat and diet of the Koala across Queensland. The study concluded that River Red Gum and Coolibah (*Eucalyptus coolabah*) were the most frequently consumed tree species by the Koala in the Desert Upland Bioregion (**Figure 3**) (Melzer *et al.*, 2014).

The main threats to the Koala are ongoing habitat loss and habitat fragmentation, vehicle strike and predation by domestic or feral dogs. Drought and incidences of extreme heat are also known to cause very significant mortality, and post-drought recovery may be substantially impaired by the range of other threatening factors (DotE, 2014t).

b. Presence in the Study Area

One individual Koala was recorded from the study area during the first survey period (**Figure 14**) in Red Gum forest. It was not recorded subsequently and is considered to be uncommon in the study area. Despite numerous surveys, only one Koala has also been recorded from the proposed Carmichael Coal Mine site, adjacent and to the south of the study area (GHD, 2013b) and accordingly this species can be considered to be locally rare.

The size of the Koala population in the study area is likely to be small. Koala densities in Central Queensland are generally low, and in the Desert Uplands Bioregion (**Figure 3**) densities are estimated to be approximately 0.005 animals per hectare (DotE, 2014t). The highest density populations tend to occur at lower altitudes in undulating country on more fertile soils. In inland areas, the Koala typically occurs in low densities and have large home ranges (DotE, 2014t). This is likely to be the case in the study area as no other sign of Koalas was recorded. Koalas are likely to mostly occur in narrow riparian corridors that support their favoured forage species of Red Gums.

The size of individual home ranges for Koalas in the arid areas of Australia is relatively large (DotE, 2014t). A study undertaken at Blair Athol Mine in Central Queensland indicated that in Central Queensland Koala home ranges are on average approximately 135 ha for males and 100 ha for females (Ellis *et al.*, 2002). These home range sizes are likely to be representative of the study area and it is likely that the Koalas in the study area have large home ranges and occur at low densities.

High value habitat for Koalas in the relatively dry Desert Uplands Bioregion occur along riparian-lined ephemeral drainage lines in lower lying areas of the study area that support River Red Gums and Forest Red Gums (*E. tereticornis*). These are known to be preferred food trees for Koalas and riparian areas are known to be refuges in dry conditions. Secondary food trees may occur in a number of other areas (e.g. seasonal wetlands) that contain Box Eucalyptus species, or Ironbark species (e.g. *E. crebra*). Although Koalas are

known to eat non-Eucalyptus species, they are only likely to do so occasionally (Wildcare Australia, 2013). The suitability of forage trees for Koalas in these areas is dependent on leaf moisture content and the production of toxins in individual trees. Other woodlands in the study area that are dominated by *Acacia* spp. (e.g. Lancewood open woodlands) may provide transitory habitat and serve as movement corridors, but lack food trees and do not provide core foraging habitat. Although these areas contain no primary food trees, they may be used periodically to allow Koalas to disperse through the landscape in order to respond to seasonal variability and access preferred food resources.

c. Habitat Modelling

Habitat modelling has been conducted for this species. **Appendix G** contains a full description of the methodology used for habitat modelling. Areas of habitat for this species within and surrounding the study area are presented on **Figures 21** and **22.**

Figure 21 shows that approximately:

- 6,878 ha of high value habitat for this species is present along ephemeral drainage lines in the study area where primary food trees (i.e. River Red Gum and Forest Red Gum) occur;
- 7,229 ha of low value habitat for this species is present in areas that are dominated by Eucalyptus, but are not preferred food tree species. This type of habitat covers the majority of the southern part of the study area, and largely excludes the sandstone ranges to the west and north; and
- 5,982 ha of unsuitable habitat for the Koala is present predominantly in the sandstone ranges in the west and north of the study area.

4.6.7 Migratory Fauna Species

In addition to the threatened species recorded from the study area, three migratory bird species listed under the EPBC Act have been recorded in the study area, namely the: Eastern Great Egret (*Ardea modesta*) (migratory and marine); Rainbow Bee-eater (*Merops ornatus*) (marine and migratory); and Satin Flycatcher (*Myiagra cyanoleuca*) (migratory and marine). A further 18 marine species were recorded and are listed in **Appendix K**.

An additional 11 migratory species were predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**) or recorded within the locality in the Queensland Wildlife Online database search (**Appendix B**). The likelihood of migratory species occurring within the study area is presented in **Table 4.10**. There were no additional EPBC Act listed migratory species, beyond those listed in **Table 4.10**, recorded from the proposed Carmichael Coal Mine site.

Table 4.10 EPBC Act Listed Migratory Fauna Species

Scientific Name	Common Name	EPBC Act Status[1]	Potential to Occur within the Study Area
Actitis hypoleucos	Common Sandpiper	Migratory, Marine	Low
Apus pacificus	Fork-tailed Swift	Migratory, Marine	High
Ardea ibis	Cattle Egret	Migratory, Marine	High
Ardea modesta	Eastern Great Egret	Migratory, Marine+	Present
Calidris acuminata	Sharp-tailed Sandpiper	Migratory, Marine	Low
Gallinago hardwickii	Latham's Snipe	Migratory, Marine	Moderate
Haliaeetus leucogaster	White-bellied Sea-Eagle	Migratory, Marine	Low
Hydroprogne caspia	Caspian Tern	Migratory	Low
Merops ornatus	Rainbow Bee-eater	Migratory, Marine	Present
Myiagra cyanoleuca	Satin Flycatcher	Migratory, Marine	Present
Plegadis falcinellus	Glossy Ibis	Migratory, Marine	Low
*Rostratula australis**	Australian Painted Snipe	Endangered, Migratory*, Marine*	Moderate
Tringa nebularia	Common Greenshank	Migratory, Marine	Low
Tringa stagnatilis	Marsh Sandpiper	Migratory, Marine	Low

[1] Threatened, migratory and/or marine species status under the EPBC Act (current at 6 March 2015.

\+ Species listed as a marine species under the EPBC Act as Great Egret (*Ardea alba*).

* Species listed as Threatened under the EPBC Act as Painted Snipe (*Rostratula australis*) (sensu lato).

The species listed in **Table 4.10** that have been assessed as having a low potential to occur within the study area are assessed in **Appendix H**.

Further detail on the migratory fauna species listed under the EPBC Act that have been recorded within the study area or have a high or moderate potential to occur within the study area is provided below.

The migratory species recorded or with high or moderate potential to occur are mostly wetland species, including the: Eastern Great Egret, Cattle Egret, Latham's Snipe, and Australian Painted Snipe. One aerial insectivore, the Fork-tailed Swift, has a high potential to occur in the study area. The Rainbow Bee-eater and Satin Flycatcher are insectivores that occur in Eucalyptus woodlands.

Only the Australian Painted Snipe is listed as Endangered under the EPBC Act. The remaining migratory species recorded or with high or moderate potential to occur are not listed as threatened under the NC Act or EPBC Act and are all relatively common, abundant and widespread species that are known to have a wide range and distribution. The habitat requirements and habitat availability in the study area for migratory species is discussed below.

a. Wetland-dependent Species

The Eastern Great Egret was recorded within the study area (**Appendix K**) and there is a high potential for the Cattle Egret and a moderate potential for Latham's Snipe and the Painted Snipe, to occur within the study area. The Australian Painted Snipe is described in **Section 4.6.6** and is not considered further in this section.

The Eastern Great Egret is listed as a migratory and marine species under the EPBC Act and was recorded during the first survey period in the seasonal wetland in the south of the study area (**Figure 14**). A single individual was observed feeding on the shallow margins of the seasonal wetland. This species usually occurs in shallow waters in a range of wetland habitats, such as inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial (DotE, 2014d). It has been recorded in swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (DotE, 2014d).

The Cattle Egret is a listed migratory and marine species under the EPBC Act and was predicted to occur within the study area in the EPBC Act Protected Matters Search (**Appendix A**). This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. This species inhabits tropical and temperate grasslands, wooded lands and terrestrial wetlands (DotE, 2014c). The Cattle Egret breeds in colonies in wooded swamps such as mangrove forests, Melaleuca swamps and the Eucalyptus/Lignum swamps of the Murray-Darling Basin (DotE, 2014c). This species has been assessed as having a high potential to occur within the study area due to the presence of habitat in the form of farm dams, seasonal wetlands (**Figure 10**) and woodlands within the study area. However, the study area lacks suitable breeding habitat for this species.

Latham's Snipe is a listed migratory and marine species under the EPBC Act and was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**). This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. This species inhabits permanent and ephemeral wetlands. Latham's Snipes are usually found in freshwater wetlands with low, dense vegetation (e.g. swamps, flooded or heathlands, around bogs and other water bodies) (DotE, 2014k). This species has also been recorded in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity (DotE, 2014k).

Limited areas of habitat are present in the study area for Latham's Snipe and are restricted to two seasonal wetlands (**Figure 10**). Although the seasonal wetlands within the study area (**Figure 10**) may be inundated during the wet season and early dry season, they are ephemeral and are consequently unreliable water sources. They are unlikely to provide important habitat for these species as they dry out in summer. Latham's Snipe has therefore been assessed as having a moderate potential of occurring within the study area due to the presence of temporary habitat in the form of the two seasonal wetlands.

b. Aerial Insectivores

The Fork-tailed Swift is the only aerial insectivorous migratory bird species that has potential to occur in the study area. The Fork-tailed Swift is a listed migratory and marine species under the EPBC Act and was predicted to occur within the study area in the EPBC Act Protected Matters Search (**Appendix A**). This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. This species is almost exclusively aerial and occurs mostly over inland plains and sometimes above foothills or in coastal areas (DotE, 2014b). This species forages in the air for insects and typically flies vast distances in search of food. The Fork-tailed Swift is known to forage over a wide range of habitats including native woodlands and forests, grasslands, and also disturbed and agricultural areas (DotE, 2014b). This species was not recorded from the study area, however it is within its range and has been assessed as having a high potential to occur within the study area.

c. Woodland Birds

Two woodland bird species, the Rainbow Bee-eater and Satin Flycatcher, have been recorded within the study area.

The Rainbow Bee-eater is a listed migratory and marine species under the EPBC Act and occurs over most of mainland Australia and is considered to be seasonally common and locally abundant throughout much of its range. It forages in a wide variety of habitats including in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (DotE, 2014q). This species breeds in tunnels, often constructed in riverbanks.

The Rainbow Bee-eater was recorded from nine locations in woodland habitat adjacent to ephemeral drainage lines in the south of the study area (**Figure 14**). These records were of single individuals foraging in trees and shrubs. Due to its wide habitat, the majority of the study area is likely to provide potential breeding and foraging habitat for this species.

The Satin Flycatcher is a listed migratory and marine species under the EPBC Act and inhabits and breeds in vegetated gullies in Eucalyptus dominated forests and taller woodlands. During its migration, this species occurs in coastal forests, woodlands, mangroves and drier woodlands and open forests (DotE, 2014r).

The Satin Flycatcher was recorded from a single location adjacent to an ephemeral drainage line located in the north-east of the southern section of the study area (**Figure 14**). This area contains woodland habitat, and the individual recorded was foraging in trees near a remnant pool in the ephemeral drainage line. It is unlikely that the study area provides ideal habitat for this species and it is unlikely to breed there, but it has potential to use parts of the study area as a foraging resource during migration.

4.6.8 Threatened Fauna Species Recorded under the NC Act

Two threatened fauna species listed under the NC Act have been recorded from the study area, namely the: Black-throated Finch (white-rumped subspecies) and Squatter Pigeon (southern subspecies) (**Appendix K**).

Table 4.11 provides a summary of the threatened fauna species listed under the NC Act that were recorded during surveys, listed from database searches as occurring in the locality or that may occur within the locality. **Table 4.11** also provides an assessment of the potential of each species to occur in the study area and supporting data for these assessments is provided in **Appendix H**. Note that there were no additional NC Act listed threatened species, beyond those listed in **Table 4.11**, recorded or assessed a having a high or moderate potential to occur at the proposed Carmichael Coal Mine site.

Table 4.11 NC Act Listed Threatened Fauna Species

Scientific Name	Common Name	NC Act Status[1,2]	Potential to Occur in theStudy Area
Threatened Fauna Species Recorded within the Study Area			
Reptiles			
Acanthophis antarcticus	Common Death Adder	Near Threatened	Present
Birds			
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	Vulnerable	Present
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	Endangered	Present
Mammals			
Phascolarctos cinereus	Koala	Special Least Concern	Present
Tachyglossus aculeatus	Short-beaked Echidna	Special Least Concern	Present
Threatened Fauna Species with the Potential to Occur within the Study Area			
Reptiles			
Egernia rugosa	Yakka Skink	Vulnerable	Low
Denisonia maculata	Ornamental Snake	Vulnerable	Low
Birds			
Erythrotriorchis radiatus	Red Goshawk	Endangered	Low
Neochmia ruficauda ruficauda	Star Finch (eastern)	Endangered	Low
Rostratula australis	Australian Painted Snipe	Vulnerable	Moderate
Mammals			
Macrotis lagotis	Greater Bilby	Endangered	Low

1 Threatened/Near Threatened species status under the NC Act (current at 6 March 2015).

2 Excludes Special Least Concern (migratory) species.

All species listed in **Table 4.11**, with the exception of the Short-beaked Echidna, are also listed under the EPBC Act and are considered in **Section 4.6.6** and **Section 4.6.7**.

The Short-beaked Echidna is listed as Special Least Concern under the NC Act and is assessed in **Section 4.6.9**.

In addition to the threatened fauna species listed in **Table 4.11**, the Common Death Adder, which is listed as Near Threatened under the NC Act, was recorded within the study area. Habitat requirements for this species is discussed in **Appendix H**.

The study area does not contain any areas of critical habitat for fauna species within the meaning of the NC Act.

4.6.9 Special Least Concern Fauna Species

Two fauna species listed as Special Least Concern species (non-migratory) under the NC Act were recorded within the study area, namely the Short-beaked Echidna and the Koala (**Appendix K**). The Koala was recorded in one location in the south-western part of the study area (**Figure 14**) and has potential to occur in low densities across much of the study area. The Koala is considered in more detail in **Section 4.6.6** and the Short-beaked Echidna is described in more detail below.

Three fauna species listed as Special Least Concern species (migratory) under the NC Act were recorded within the study area, namely the Eastern Great Egret, Rainbow Bee-eater and Satin Flycatcher. These species are considered in more detail in **Section 4.6.7**.

i. Short-beaked Echidna

a. Species Overview

The Short-beaked Echidna is listed as Special Least Concern under the NC Act. This species was recorded once within Eucalyptus-dominated woodland in the southern portion of the study area during recent surveys (**Figure 14**) and was listed in the Queensland Wildlife Online database search (**Appendix B**) as occurring within the locality.

The Short-beaked Echidna can inhabit the majority of habitat types that contain a good supply of food. They inhabit a wide range of terrestrial habitats wherever there are enough ants or termites including: deserts, the rainforest, open forest, bushland, farmland and suburban backyards. In Australia, they are most common in forested areas with abundant, termite-filled, fallen logs (Wildlife Preservation Society of Queensland, 2013).

Threats to the Short-beaked Echidna include predation by cats and Dingos and vehicle strike (Wildlife Preservation Society of Queensland, 2013).

b. Presence in Study Area

The Short-beaked Echidna was recorded opportunistically in one location within Eucalyptus-dominated woodland in the southern portion of the study area during the October 2013

survey (**Figure 14**). Evidence (i.e. characteristic diggings and scats) of this species were recorded at five locations within the proposed Carmichael Coal Mine site.

c. Habitat Modelling

Habitat mapping has been conducted for this species that identified potential habitat according to the methodology outlined in **Appendix G**. Areas of habitat for this species within and surrounding the study area are presented on **Figures 23** and **24.**

Figure 23 shows that approximately:

- 16,226.2 ha of high value habitat for this species is present in the southern portion of the study area where lower-lying flat grassy woodland areas occur and in the northern-central upland areas of the study area where similar habitats are present; and
- 3,861.7 ha of low value habitat for this species is present in the central and northern portions of the study area.

CUMBERLAND ECOLOGY

Chapter **5**

Impact Assessment

5.1 Introduction

This section presents an assessment of the likely impacts of the project to terrestrial ecology, with a focus on species listed under the EPBC Act and/or NC Act recorded during the field surveys or considered to have potential to occur due to the presence of suitable habitat.

Project activities that have the potential to impact flora and fauna species include:

- Vegetation clearing for the open cut mining and the construction of mine infrastructure (**Section 5.2**);
- Subsidence resulting from underground mining, and the disturbance of vegetation as part of the:
  - Subsidence crack rehabilitation program (**Section 5.3**); and
  - Drainage changes due to subsidence (**Section 5.4**); and
- Indirect impacts such as the effects of noise and vibration, vehicle strikes, lighting, dust, erosion and the introduction of invasive species (**Section 5.5**).

This section considers these three categories of impacts of the project separately for vegetation communities, flora species and fauna species. In each section, the impacts of vegetation clearing, subsidence and indirect impacts are considered for each listed vegetation community or threatened species with potential to be impacted by the project. A summary of the potential impacts on listed threatened vegetation communities and species is listed in **Section 5.9**. Mitigation measures for these impacts are described in **Section 6**.

5.2 Direct Vegetation Clearing

5.2.1 Overview of Clearing

The most substantial impacts of the project will arise from vegetation clearance - mainly the clearing of open forest, woodland and shrubland. Vegetation clearance will be required to allow for open cut mining and the construction of mine infrastructure and approximately 11,000 ha of vegetation will be cleared for these components of the project. **Figure 25**

shows the project clearing footprint (i.e. the footprint of clearing associated with open cut mining and the construction of mine infrastructure).

The majority of the vegetation to be cleared (11,000 ha or 99.8%) comprises widespread REs that are listed as Least Concern under the VM Act. A total of 24 ha (0.2%) of the land to be cleared comprises an RE listed as Of Concern. **Table 5.1** provides a breakdown of the areas of each vegetation community that are proposed to be cleared.

Table 5.1 Regional Ecosystems within the Open Cut Mine and Mine Infrastructure Area Clearing Footprint

RE Code	Vegetation Type	Conservation Status			Clearance area (ha)
		EPBC Act[1]	VM Act[2]	Biodiversity Status[2]	
10.3.6	Eucalyptus open woodland	-	Least Concern	No concern at present	1,483.8
10.3.6a	Eucalyptus open woodland	-	Least Concern	No concern at present	251.8
10.3.14	Eucalyptus open woodland along channels and on floodplains	-	Least Concern	Of Concern	16.1
10.3.28a	Eucalyptus open woodland	-	Least Concern	No concern at present	936.1
10.5.1a	Eucalyptus open woodland	-	Least Concern	No concern at present	2,459
10.5.1c	Eucalyptus and Rough-leaved Bloodwood low open woodland	-	Least Concern	No concern at present	164.7
10.5.1d	Rough-leaved Bloodwood low open woodland	-	Least Concern	No concern at present	54.5
10.5.4	Eucalyptus open woodland	-	Least Concern	No concern at present	1,270.1
10.5.5a	Silver-leaved Ironbark open woodland	-	Least Concern	No concern at present	3,032.8
10.5.10	Yellowjacket open woodland	-	Least Concern	No concern at present	133.5
10.7.2a	*Eucalyptus persistens* low open woodland	-	Least Concern	No concern at present	82.2
10.7.3a	Bendee low woodland	-	Least Concern	No concern at present	30.5
10.7.3b	Lancewood woodland	-	Least Concern	No concern at present	71.2
10.7.3c	Shiny-leaved Bloodwood and/or *C. leichhardtii*	-	Least Concern	No concern at present	400.1

RE Code	Vegetation Type	Conservation Status			Clearance area (ha)
		EPBC Act[1]	VM Act[2]	Biodiversity Status[2]	
	open woodland				
10.7.4	Eucalyptus low open woodland	-	Least Concern	No concern at present	5.1
10.7.5	Lapunyah open woodland	-	Least Concern	Of Concern	1.2
10.7.7b	Melaleuca low open woodland	-	Least Concern	No concern at present	38.9
10.7.11a	Silver-leaved Ironbark low open woodland	-	Least Concern	No concern at present	69.9
10.7.12a	Narrow-leaved Ironbark open woodland	-	Least Concern	No concern at present	181.1
10.10.1a	Lancewood woodland	-	Least Concern	No concern at present	87.5
10.10.1b	Bendee low woodland	-	Least Concern	No concern at present	7.6
10.10.3	Narrow-leaved Ironbark open woodland	-	Of Concern	Of Concern	24.1
10.10.4a	Yellowjacket open woodland	-	Least Concern	No concern at present	99.2
10.10.4c	Inland Yellow Jacket open woodland	-	Least Concern	No concern at present	96.3
				TOTAL (ha)*	**10,997.3**

1 TEC Status under the EPBC Act (current at 6 March 2015).

2 Threatened RE status and Biodiversity Status under the VM Act (current at 6 March 2015).

* In some cases totals may not equal the appropriate total number due to rounding.

The proposed layout has been designed to avoid Of Concern REs and high value habitats for fauna species wherever possible. Clearing activities will be subject to a number of controls to ensure that impacts are limited to the areas required to be cleared. These controls are outlined in **Section 6**, and include measures such as conducting pre-clearance surveys and demarcating construction areas to limit disturbance to the minimum area required for the work.

The vegetation proposed to be cleared provides habitat for a range of native flora and fauna species, including some listed under the EPBC Act and/or the NC Act. Vegetation clearance has potential to directly impact species via habitat loss, and also through indirect impacts. These potential impacts are discussed in **Sections 5.2.2** to **5.2.8**.

5.2.2 Impacts of Vegetation Clearing on EPBC Act Listed Vegetation Communities

As detailed in **Section 4.3.2**, the study area does not contain any EPBC Act listed vegetation communities and the project will consequently not have any impact on EPBC Act listed communities.

5.2.3 Impacts of Vegetation Clearing on Queensland Listed Vegetation Communities

i. Threatened Vegetation Communities

The project will involve the removal of approximately 11,000 ha of remnant vegetation in the southern portion of the study area (**Figure 25**). The majority of this vegetation is listed as Least Concern under the VM Act, however 24 ha of an RE that is listed as Of Concern under the VM Act would be removed by the project, namely RE 10.10.3: *Eucalyptus drepanophylla* open woodland on sandstone ranges.

A total of 270 ha of RE 10.10.3 occurs in the study area, and 24 ha occurs in the clearing footprint and will be removed by the project (i.e. approximately 9% of the total RE in the study area would be removed). This is a very small proportion of this RE that occurs in the study area, and the vast majority would be retained in areas to the west that would not be subject to clearing.

Offsets are required for any significant residual impacts on Of Concern vegetation listed under the NC Act. In accordance with Table 1 of the *Queensland Environmental Offsets Policy Significant Residual Impacts Guideline* (EHP, 2014d), offsets are required if more than 2 ha of sparse Of Concern vegetation is cleared. Approximately 24 ha of RE 10.10.3 which is classified as Of Concern vegetation with a sparse structure will be cleared for the project. In accordance with the QEOP, the removal of this vegetation for the project will have a significant residual impact and will require offsets under the EO Regulation. Offsets required for the project are described in more detail in **Section 7**.

ii. Impacts of Vegetation Clearing on Vegetation Communities along Watercourses

The EHP's Vegetation Management Watercourse Map has been overlaid on the RE mapping to determine the areas of riparian vegetation that are classified as MSES. Vegetation located within 25 m of a stream order 1 and 2, 50 m of a stream order of 3 and 4 or 100 m of a stream order of 5 or greater, is classified as MSES. The REs and areas that are classified as a MSES in accordance with the QEOP are outlined below in **Table 5.2**.

Table 5.2 REs along Watercourses Classified as MSES

RE Code	Vegetation Type	Status under the VM Act[1]	Vegetation Structure	Area Classified as a MSES (ha)
10.3.6	Eucalyptus open woodland	Least Concern	Very sparse	63.2
10.3.14	Eucalyptus open woodland along channels and on floodplains	Least Concern	Sparse	14.1

RE Code	Vegetation Type	Status under the VM Act[1]	Vegetation Structure	Area Classified as a MSES (ha)
10.3.16d	Ephemeral lakes with sparse-herbland or sparse-tussock grassland	Least Concern	Very sparse	27.2
10.3.28a	Eucalyptus open woodland	Least Concern	Very sparse	63.4
10.5.1a	Eucalyptus open woodland	Least Concern	Very sparse	12.3
10.5.1c	Eucalyptus and Rough-leaved Bloodwood low open woodland	Least Concern	Very sparse	0.7
10.5.1d	Rough-leaved Bloodwood low open woodland	Least Concern	Very sparse	3.8
10.5.4	Eucalyptus open woodland	Least Concern	Very sparse	2.4
10.5.5a	Silver-leaved Ironbark open woodland	Least Concern	Very sparse	65.0
10.5.10	Yellowjacket open woodland	Least Concern	Very sparse	14.5
10.7.2a	*Eucalyptus persistens* low open woodland	Least Concern	Very sparse	4.9
10.7.3a	Bendee low woodland	Least Concern	Very sparse	0.1
10.7.3b	Lancewood woodland	Least Concern	Very sparse	8.4
10.7.3c	Shiny-leaved Bloodwood and/or *C. leichhardtii* open woodland	Least Concern	Very sparse	32.9
10.7.4	Eucalyptus low open woodland	Least Concern	Very sparse	0.3
10.7.5	Lapunyah open woodland	Least Concern	Sparse	0.01
10.7.7b	Melaleuca low open woodland	Least Concern	Very sparse	<0.01
10.7.12a	Narrow-leaved Ironbark open woodland	Least Concern	Very sparse	17.2
10.10.1a	Lancewood woodland	Least Concern	Very sparse	7.6
10.10.1b	Bendee low woodland	Least Concern	Very sparse	0.5
10.10.3	Narrow-leaved Ironbark open woodland	Of Concern	Very sparse	2
10.10.4a	Yellowjacket open woodland	Least Concern	Very sparse	10.3
10.10.4c	Inland Yellow Jacket open woodland	Least Concern	Very sparse	8.2
		TOTAL (ha)*		**359**

[1] Threatened RE status under the VM Act (current at 6 March 2015).

* In some cases totals may not equal the appropriate total number due to rounding.

The loss of riparian vegetation will impact on native species through the removal of habitat. Due to the presence of water (even seasonally), riparian vegetation is often denser, and has a greater species richness than adjacent areas. Accordingly, riparian vegetation provides high quality habitat for fauna. This habitat may provide refuge in times of drought, and shelter for fauna utilising watercourses to drink.

Offsets are required for any significant residual impacts on the vegetation listed in **Table 5.2**. In accordance with Table 1 of the *Queensland Environmental Offsets Policy Significant Residual Impacts Guideline* (EHP, 2014d), offsets are required if more than 2 ha of sparse vegetation is cleared. All of the vegetation within the project site has been classified as

either sparse or very sparse. Approximately 14 ha of sparse and 345 ha of very sparse vegetation will be cleared for the project. In accordance with the QEOP, the removal of this vegetation for the project will have a significant residual impact and will require offsets under the EO Regulation. Offsets required for the project are described in more detail in **Section 7**.

5.2.4 Impacts of Vegetation Clearing on EPBC Act Flora Species

As discussed in **Section 4.5.1**, no threatened flora species listed under the EPBC Act were recorded or are considered likely to occur within the study area. Therefore, no threatened flora species listed under the EPBC Act will be impacted as a result of the clearing associated with the project.

5.2.5 Impacts of Vegetation Clearing on NC Act Flora Species

As discussed in **Section 4.5.2**, no threatened flora species listed under the NC Act were recorded or are considered likely to occur within the study area. Therefore, no threatened flora species listed under the NC Act will be impacted as a result of the clearing associated with the project.

5.2.6 General Impacts of Vegetation Clearing on Fauna Species

i. Loss of Habitat Features

The largest direct impact of vegetation clearing for the project would be the removal of woodland vegetation that provides habitat for a wide range of fauna species. Other habitats that occur aside from woodland vegetation that will be cleared include rock outcrops, the southern seasonal wetland, the southern farm dam and ephemeral drainage lines (**Figure 25**).

Vegetation is in relatively good condition across the study area and provides habitat for a range of fauna; including some species that are listed under the EPBC Act and/or the NC Act. Within these vegetation communities, a range of habitat features provide foraging, shelter and breeding opportunities for fauna. Important fauna habitat features that may be removed by the project are:

- Dense understorey vegetation – shelter and foraging habitat for amphibians, reptiles, small birds and terrestrial mammals;
- Fallen logs, debris and leaf litter – shelter habitat for amphibians, reptiles and terrestrial mammals;
- Rocky outcrops – shelter and breeding habitat for amphibians, reptiles and terrestrial mammals;
- Hollow-bearing living trees and stags – shelter and breeding habitat for a range of reptiles, birds, arboreal mammals and microbats;

- Nectar-producing trees and shrubs – foraging habitat for insects, blossom-dependent birds, arboreal mammals and megachiropteran bats (flying-foxes);
- Food trees, shrubs and grasses for a range of species – food for small birds, cockatoos, Koalas and other herbivorous mammals;
- Ecotonal (edge) communities – foraging habitat for many species, particularly birds;
- Ephemeral drainage lines – foraging, shelter and breeding habitat for amphibians, aquatic reptiles, wetland birds and aquatic mammals; and
- Seasonal wetlands with aquatic vegetation – seasonal foraging and breeding habitat for amphibians, aquatic reptiles and wetland birds.

ii. Habitat Fragmentation

One of the impacts of the project on flora and fauna would be habitat fragmentation. Fragmentation is the process where habitats that were once continuous become divided into separate fragments isolated from each other by non-forest land (Primack, 1993; Fahrig, 2003; Lindenmayer and Fischer, 2006). The resultant divided habitat is often artificial and inhospitable to the species remaining within the fragments (Bennett, 1990; Reid, 1999).

Habitat fragmentation affects biodiversity by reducing the amount of available habitat for some species as it involves some habitat loss. Plants and other sessile organisms are usually directly removed, while mobile animals (especially birds and mammals) retreat into other remnant patches of habitat (Lindenmayer and Fischer, 2006). Indirectly, fragmentation can put stress on native flora and fauna by increasing intraspecific and interspecific competition for space and resources in areas of remaining habitat.

Barrier effects are another impact of habitat fragmentation. This occurs where particular species are either unable, or are unwilling, to move between suitable areas of fragmented habitat. Species that are most vulnerable to barrier effects include rare species, smaller ground-dwelling species and species with low mobility. Species that are least vulnerable to barrier effects tend to be those that are large or highly mobile (e.g. birds and bats), as they can readily move between fragments (Bennett, 1990). The clearance of vegetation associated with open cut mining and the development of mine infrastructure is unlikely to affect the majority of threatened species present within the study area, as these species are mainly mobile species (birds), and these have potential to move across disturbed areas into adjoining vegetation.

As shown on **Figure 26**, the study area is located within a large area of contiguous remnant vegetation. Areas of remnant vegetation extend significant distances to the north, south and west of the study area, and there is remnant vegetation some distance to the east. The extent of contiguous remnant vegetation extends well beyond the area mapped as a State Significant Corridor in the BPA mapping (**Section 4.1.10**).

Consequently, the extent of the corridor in the study area is not likely to be significant, given that the BPA mapping does not align with the contiguous remnant vegetation and the study area could therefore be expected to be part of a broader biodiversity corridor, encompassing the remnant vegetation that is within and surrounding the study area. Clearing associated with open cut mining and the development of mine infrastructure could be anticipated to potentially impact habitat connectivity. However, as the clearing of vegetation is only in the southern portion of the study area, full east to west connectivity will remain in the northern portion of the study area (**Figure 26**). In addition, areas beyond the clearing footprint will be managed to retain and enhance biodiversity values (**Section 6**). Progressive rehabilitation of areas disturbed by open cut mining will also be undertaken, which will serve to reduce the severity of the potential impact on habitat connectivity.

The potential impact on habitat connectivity has also been considered in relation to the cumulative impacts from the project and the CCM&RP, located adjacent to the study area. **Figure 26** shows the proposed location of clearing associated with open cut mining and infrastructure development for the project and the CCM&RP. Key factors to be considered in assessing this impact are that the open cut mining/infrastructure footprints for these two projects are approximately 10 km apart, leaving a large corridor of remnant vegetation between the cleared areas. This will allow for continued movement and dispersal opportunities.

It is considered unlikely that the project will have a significant residual impact on connectivity in the locality due to the high amount of remnant vegetation available in the landscape around the study area, and the fact that there will be staged rehabilitation of the mined area. In accordance with the *Queensland Environmental Offsets Policy Significant Residual Impacts Guideline* (EHP, 2014d), the EHP's Landscape Fragmentation and Connectivity (LCF) Tool was used to assist in identifying and quantifying any significant impact as a result of the project on connectivity. The EHP's LCF Tool determined that the project would not result in a significant residual impact on local or regional connectivity and therefore offsets for connectivity are not required for the project.

iii. Edge Effects

A consequence of habitat fragmentation is that it produces "edge effects". Edge effects are impacts that occur at the interface between natural habitats, especially forests and disturbed or developed land (Yahner, 1988). When an edge is created between woodland and a cleared area, changes to ecological processes within the vegetation can extend between 10 m and 100 m from the edge (Yahner, 1988). These include microclimatic changes in light, temperature, humidity and wind, which can favour a suite of different species and therefore cause significant changes to the ecology of the patch (Lindenmayer and Fischer, 2006). These changes include; invasion by weeds, increase in feral animals, reduction in tree health, and barriers to dispersal or distribution (Yahner, 1988).

The project will result in edge effects where woodland is cleared for open cut mining and the construction of mine infrastructure. Due to edge effects, the effects of clearing are likely to extend beyond the areas that are being cleared and into areas of adjacent woodland that are being retained.

5.2.7 Impacts of Vegetation Clearing on EPBC Act Fauna Species

A number of threatened fauna species listed under the EPBC Act were recorded within the study area during the field surveys. Several additional threatened species have the potential to occur within the study area, given the proximity of recent database records and the presence of suitable habitat for these species. This section provides an assessment of the potential impacts of vegetation clearing to threatened fauna species listed under the EPBC Act that have been recorded from the study area, or which have high potential to occur. **Figures 27** to **30** show proposed habitat for these fauna species within the disturbance area and **Table 5.3** shows areas of high value habitat proposed to be cleared.

Table 5.3 Proposed Clearing of High Value Habitat for Threatened/Special Least Concern Fauna Species

Species	Conservation Status[1]		Total High Value Habitat in the Study Area (ha)	Area Cleared for Open Cut Mine and Mine Infrastructure (ha)	% Cleared
	EPBC Act	NC Act			
Squatter Pigeon (southern subspecies)	V	V	3,440	1,436	41.7%
Black-throated Finch (white-rumped subspecies)	E	E	7,065.9	4,434	62.7%
Australian Painted Snipe	E	E	135.2	12.0	8.9%
Koala	V	SLC	6,877.5	3,246	47.1%

[1] Threatened and/or Special Least Concern species status under the EPBC Act and/or NC Act (current at 6 March 2015).
V = Vulnerable; E = Endangered; SLC = Special Least Concern

i. Squatter Pigeon (southern subspecies)

Numerous records of the Squatter Pigeon (southern subspecies) were made during the field survey, and this species is considered to be common in the study area. It is likely to occur across the majority of the southern and eastern sections of the study area and also in some parts in the north of the study area. Such areas contain relatively deep and/or fertile soil and support woodlands with a wide diversity of grasses which this species relies on for feeding (DotE, 2014l).

Habitat modelling indicates that approximately 3,440 ha of high value habitat for the Squatter Pigeon (southern subspecies) is present in the study area (**Table 5.3**; **Figure 15**). Large areas of similar vegetation occur outside of the study area that are also likely to provide similar habitat for this species (**Figure 16**). The Squatter Pigeon (southern subspecies) has also been recorded numerous times in the adjacent proposed Carmichael Coal Mine site (GHD, 2013b) within a range of grassy woodland habitats.

Approximately 1,436 ha (42%) of high value habitat for the Squatter Pigeon (southern subspecies) would be cleared for open cut mining and the construction of mine infrastructure

(**Table 5.3; Figure 27**). Despite this reduction, the project is unlikely to result in the fragmentation of potential Squatter Pigeon (southern subspecies) foraging habitat, as connectivity will remain between retained vegetation to the north and south of the open cut mining area and adjoining vegetation.

A range of impact avoidance and mitigation measures are proposed to minimise impacts on this species and they are outlined in **Section 6**. This includes pre-clearance surveys and undertaking progressive rehabilitation of mined areas. In addition, the remainder of the study area will also be managed to enhance habitat values in accordance with a Biodiversity Management Plan. Measures to enhance habitat values will include establishing fauna watering points and managing cattle grazing pressure.

An assessment of significance has been conducted for this species according to the EPBC Act Significant Impact Guidelines for Vulnerable species (**Appendix L**). This assessment indicates that the project has the potential to give rise to a significant impact on the Squatter Pigeon (southern subspecies). This is primarily due to the clearance of large areas of high value habitat for this species. It will therefore be necessary to provide offsets for this impact.

Offsets will be in accordance with a comprehensive Biodiversity Offset Strategy that will be prepared to compensate for the removal of habitat for the Squatter Pigeon (southern subspecies) (**Section 7**). This will include the provision of areas of habitat for this species that will be conserved and managed for biodiversity in perpetuity.

ii. Black-throated Finch (white-rumped subspecies)

The Black-throated Finch (white-rumped subspecies) was recorded from several woodland locations in the study area during the field surveys, and habitat modelling indicates that high value habitat for this species occurs in the southern and eastern sections of the study area. It has potential to occur across the majority of the southern portion of the study area. These areas contain fertile soil and water resources, and support woodlands with a wide diversity of grasses which this species relies on as a food resource (Black-throated Finch Recovery Team, 2007). Habitat modelling indicates that 7,066 ha of high value habitat for the Black-throated Finch (white-rumped subspecies) is present in the study area (**Table 5.3; Figure 17**).

Although a relatively large area of known and potential Black-throated Finch (white-rumped subspecies) habitat occurs within the study area, large areas of similar vegetation occurs outside the study area that are likely to provide similar habitat for this species (**Figure 18**). The Black-throated Finch (white-rumped subspecies) has been recorded extensively on the neighbouring proposed Carmichael Coal Mine site and this project mapped large areas of habitat on and adjoining their project area (GHD, 2014b).

A total of 4,434 ha (63%) of high value habitat will be cleared for the Black-throated Finch (white-rumped subspecies) for open cut mining and the construction of mine infrastructure (**Table 5.3; Figure 28**). Despite this reduction, the project is unlikely to result in the severance of connectivity of Black-throated Finch (white-rumped subspecies) habitat, as connected vegetation will remain between retained vegetation to the north and south of the clearing footprint and adjoining vegetation.

A range of impact avoidance and mitigation measures are proposed to minimise impacts on this species and they are outlined in **Section 6**. This includes pre-clearance surveys and undertaking progressive rehabilitation of mined areas. In addition, the remainder of the study area will also be managed to enhance habitat values in accordance with a Biodiversity Management Plan. Measures to enhance habitat values will include establishing fauna watering points and managing cattle grazing pressure.

An assessment of significance has been conducted for this species according to the EPBC Act Significant Impact Guideline for Endangered species (**Appendix L**). This assessment indicates that the project has the potential to give rise to a significant impact on the Black-throated Finch (white-rumped subspecies). This is primarily due to the clearing of large areas of high value habitat for this species. It will therefore be necessary to provide offsets for this impact.

Offsets will be provided for this species according to a comprehensive Biodiversity Offset Strategy that will be prepared to compensate for the removal of habitat for the Black-throated Finch (white-rumped subspecies) (**Section 7**). This will include the provision of areas of habitat for this species that will be conserved and managed for biodiversity in perpetuity.

iii. Australian Painted Snipe

Although not recorded during the field survey from the study area or from the nearby proposed Carmichael Coal Mine site, the Australian Painted Snipe has moderate potential to occur within the study area based on the presence of suitable habitat. This is a wetland dependent species and the two seasonal wetlands in the study area are likely to provide both potential foraging and breeding habitat for this species (**Figure 19**).

A total of 135 ha of seasonal wetland habitat is present in the study area that is likely to provide potential habitat for this species (**Table 5.3**). This area is likely to fluctuate throughout the year, depending on the amount of rainfall, and 135 ha represents the maximum extent of seasonal wetland habitat likely to be present in the study area at any time. For the majority of the year, there is likely to be significantly less habitat than this present, as the ponded water within the wetland recedes and evaporates following the wet season. By the end of the dry season, the seasonal wetland habitat present in the study area would usually be reduced to the farm dam adjacent to the larger seasonal wetland located in the north of the study area, with only a small area of wetland habitat (if any) remaining next to it. Accordingly, the seasonal wetland habitat present in the study area is not considered to be an important habitat resource for the Australian Painted Snipe or other wetland birds. A large area of more significant habitat for wetland birds is present nearby in Lake Buchanan and Lake Galilee, which are located approximately 17 km via direct line to the west of the study area and 45 km via direct line to the south-west of the study area, respectively (**Figure 3**).

Approximately 12 ha of potential habitat for the Australian Painted Snipe will be cleared for open cut mining and the construction of mine infrastructure (**Table 5.3; Figure 29**). This represents a 9% reduction of habitat in the study area for this species (**Table 5.3**). Despite this reduction, the project is unlikely to result in the fragmentation of potential Australian

Painted Snipe habitat, as this species is able to fly over disturbed areas to access new habitat resources relatively easily.

A range of impact avoidance and mitigation measures are proposed to minimise impacts on this species and they are outlined in **Section 6**. This includes pre-clearance surveys and undertaking progressive rehabilitation of mined areas. In addition, the remainder of the study area will also be managed to enhance habitat values in accordance with a Biodiversity Management Plan. Measures to enhance habitat values will include establishing fauna watering points and managing cattle grazing pressure.

An assessment of significance has been conducted for this species according to the EPBC Act Significant Impact Guidelines for Endangered species (**Appendix L**). This assessment indicates that due to the small area of impact, the seasonal nature of the wetlands present in the study area and the large areas of suitable habitat that will remain nearby, no significant impact is likely to occur to the Australian Painted Snipe as a result of the project.

iv. Koala

One Koala was recorded in the study area during the field survey, as discussed in **Section 4.6.6.** This species has potential to be present throughout select Eucalyptus-dominated woodlands of the study area, particularly those dominated by Red Gums; albeit in low numbers and density.

According to the *EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (DotE, 2014i), the study area comprises "Critical Habitat" for the Koala. That notwithstanding, a more detailed analysis of the relative quality of habitat in the study area for the Koala has been undertaken for this project to identify areas of high, low and unsuitable habitat in the study area (**Appendix G**).

Habitat modelling has indicated that 6,878 ha of high value habitat for the Koala is present in the study area (**Table 5.3; Figure 21**). Areas of primary habitat are present in the ephemeral drainage lines and riparian areas where primary food trees (i.e. River Red Gum and Forest Red Gum) are present. High value habitat includes these vegetation types and a 1 km buffer. Based on published literature about Koala food preferences in central and northern Queensland (Ellis *et al.*, 2002), other areas of the study area that are dominated by secondary food trees such as Gums, Box Eucalyptus Ironbarks or Paperbarks are likely to be less used and so considered as representing low value habitat. Areas where Koala food trees are absent are considered to be of marginal value and would usually only be used to disperse through.

Only one animal was detected during the surveys for the project, indicating that this species occurs at low density. Based on published literature, taking the density of Koalas as approximately 0.005 animals per hectare as estimated for the Desert Uplands Bioregion (**Figure 3**) (DotE, 2014t), it is possible that approximately 60 animals are present within the study area. These are likely to be concentrated in riparian habitats, and absent across broad areas of the study area.

Approximately 3,246 ha of high value habitat is in the clearing footprint of the project and will be removed by the project (**Table 5.3; Figure 30**). Despite this reduction, the project is unlikely to sever habitat connectivity of Koala habitat, as connectivity will remain between retained vegetation to the north and south of the open cut mining area and adjoining vegetation.

A range of impact avoidance and mitigation measures are proposed to minimise impacts on this species and they are outlined in **Section 6**. This includes pre-clearance surveys and undertaking progressive rehabilitation of mined areas. In addition, the remainder of the study area will also be managed to enhance habitat values in accordance with a Biodiversity Management Plan. Measures to enhance habitat values will include establishing fauna watering points and managing cattle grazing pressure.

An assessment of significance has been conducted for this species according to the EPBC Act Significant Impact Guidelines for Vulnerable species (**Appendix L**). This assessment indicates that the project has the potential to give rise to a significant impact on the Koala. This is primarily due to the clearance of large areas of high value habitat for this species. It will therefore be necessary to provide offsets for this impact.

Offsets will be provided for this species according to a comprehensive Biodiversity Offset Strategy that will be prepared to compensate for the removal of habitat for threatened species including the Koala (**Section 7**). This will include the provision of areas of habitat for this species that will be conserved and managed for biodiversity in perpetuity.

v. Migratory Fauna Species

Three migratory bird species listed under the EPBC Act have been recorded in the study area: the Eastern Great Egret (migratory and marine); the Rainbow Bee-eater (marine and migratory); and the Satin Flycatcher (marine and migratory).

Although not recorded, several other species listed as migratory and/or marine under the EPBC Act have potential to occur in the study area due to the presence of suitable habitat. These species are not listed as threatened species and they are considered to be relatively abundant. These include the following species:

- Cattle Egret;
- Latham's Snipe;
- Fork-tailed Swift; and
- Australian Painted Snipe.

Potential habitat occurs in the study area for these species which may be used periodically, as discussed below. The Australian Painted Snipe is described in detail in **Section 4.6.6iii**.

The Cattle Egret inhabits tropical and temperate grasslands, wooded lands and terrestrial wetlands (DotE, 2014c). This species has been assessed as having a high potential to occur within the study area due to the presence of habitat in the form of farm dams, seasonal

wetlands (**Figure 10**) and woodlands within the study area. However, the study area lacks suitable breeding habitat for this species. The entire study area is likely to provide habitat for this species. A total of 11,000 ha of habitat for this species is proposed to be cleared for open cut mining and the construction of mine infrastructure.

Latham's Snipe and the Eastern Great Egret are wetland-dependent species and potential habitat for these species within the study area is restricted to the two seasonal wetlands. The southern seasonal wetland (approximately 12 ha) will be removed as a result of the project. The habitat resources at the southern seasonal wetland are relatively small, as this wetland is ephemeral and not present in the dry season and it is therefore not likely to constitute important habitat. A large area of more significant habitat for wetland birds is present nearby in Lake Buchanan and Lake Galilee, which are located approximately 17 km via direct line to the west of the study area and 45 km via direct line to the south-west of the study area, respectively (**Figure 3**).

The Fork-tailed Swift is an aerial feeding bird that is likely to find suitable foraging resources over the majority of the study area. These are extremely wide-ranging birds that access resources from across a large area and they are unlikely to be dependent on the resources present in the study area for their survival. A total of 11,000 ha of potential habitat for this species would be removed.

The Rainbow Bee-eater and Satin Flycatcher both have potential foraging habitat in the study area in the form of woodland vegetation. The entirety of the clearing footprint is likely to provide habitat for the Rainbow Bee-eater and the Satin Flycatcher and 11,000 ha of habitat for these species would be removed. Large areas of similar vegetation occur outside the study area that provide similar habitat for these species.

The study area is not considered to comprise important habitat for any of the migratory species. Large areas of similar habitat occur elsewhere in the locality that will remain and will continue to provide high quality habitat for these species. There is no evidence to suggest that the study area supports an ecologically significant proportion of the population of these migratory species and no breeding was observed during field surveys. An assessment of significance has been conducted for the migratory species recorded and with potential to occur in the study area according to the EPBC Act Significant Impact Guidelines for listed migratory species (**Appendix L**). These assessments indicate that no significant impact is likely to occur to any migratory species listed under the EPBC Act.

5.2.8 Impacts of Vegetation Clearing on NC Act Fauna Species

A number of threatened fauna species listed under the NC Act were recorded within the study area during the field surveys, all of which, except for the Short-beaked Echidna, are also listed under the EPBC Act and have been considered previously in **Section 5.2.7**.

Species listed under the EPBC Act that are also listed under the NC Act are as follows: Squatter Pigeon (southern subspecies), listed as Vulnerable; Black-throated Finch (white-rumped subspecies), listed as Endangered; Australian Painted Snipe, listed as Endangered; and Koala, listed as Special Least Concern. Assessment of the impacts to these species has been undertaken in accordance with the EPBC Act Significant Impact Guidelines

(**Appendix L**). The results of these assessments have been applied to the assessment of these species under state legislation. The assessments indicate that the project has the potential to give rise to a significant impact on the Squatter Pigeon (southern subspecies), Black-throated Finch (white-rumped subspecies) and Koala. As such, it will therefore be necessary to provide offsets for this impact. No significant impact is predicted on the Australian Painted Snipe.

Potential impacts on the Short-beaked Echidna are provided below.

i. Short-beaked Echidna

One Short-beaked Echidna was recorded during the field survey in the southern portion of the in the study area (**Figure 14**). It is likely to occur across the majority of the southern and eastern sections of the study area and also in some parts of the north of the study area.

Habitat modelling indicates that approximately 16,226 ha of high value habitat for the Short-beaked Echidna is present in the study area (**Figure 23**). Large areas of similar vegetation occur outside of the study area that are also likely to provide similar habitat for this species (**Figure 24**). The Short-beaked Echidna has also been recorded at the adjacent proposed Carmichael Coal Mine site (GHD, 2012c).

Approximately 10,880 ha (67%) of high value habitat for the Short-beaked Echidna would be cleared for the open cut mining and the construction of mine infrastructure (**Figure 31**). Despite this reduction, the project is unlikely to result in the fragmentation of potential Short-beaked Echidna foraging habitat, as connectivity will remain between retained vegetation to the north and south of the open cut mining area and adjoining vegetation.

A range of impact avoidance and mitigation measures are proposed to minimise impacts on this species and they are outlined in **Section 6**. This includes pre-clearance surveys and undertaking progressive rehabilitation of mined areas. In addition, the remainder of the study area will also be managed to enhance habitat values in accordance with a Biodiversity Management Plan. Measures to enhance habitat values will include establishing fauna watering points and managing cattle grazing pressure.

Although the Short-beaked Echidna is not a threatened species, offsets are required for the Short-beaked Echidna according to the EO Regulation, in the event of the project giving rise to a significant residual impact on this species. It has been assessed that the project is unlikely to have a significant residual impact on this species due to its broad habitat requirements and widespread areas of potential breeding and foraging habitat that will remain outside the project clearing footprint (**Appendix M**).

5.3 Subsidence Cracking

5.3.1 Overview of Subsidence Cracking

Longwall mining is a method of underground coal mining whereby large, rectangular panels of coal are progressively mined. As the coal is extracted, the roof immediately above the

mined seam collapses, leading to fracturing and settling of material in the overlying strata. This can result in the progressive formation of gentle trough-like depressions on the surface relative to natural topography (called subsidence). The subsidence effect moves across the ground surface above the retreating longwall at approximately the same speed as the advance of the longwall mining face, which is typically up to 100 m per week. The majority of subsidence at a point on the surface occurs within three months of mining and all subsidence is generally completed within 12 months. The depth of subsidence is generally greatest in the centre of the longwall panels and the least above the chain pillars.

Figure 32 shows the proposed longwall mine layout for the project. The areas that will be subject to subsidence are shown on **Figure 33**, and are defined as the areas within the predicted limit of measureable subsidence. Two coal seams are proposed to be mined in the majority of the Northern Underground Mining Area, and consequently the ground surface in these areas will be subsided twice. Predicted maximum vertical subsidence (at the conclusion of all mining activities) ranges from 2.2 to 6 m in the underground mining area, with deeper vertical subsidence in the shallower dual seam areas of the Northern Underground Mining Area. The EIS Subsidence Report provides further detail on subsidence, and the subsidence predictions for the project.

The differential lowering of the ground surface due to subsidence leads to areas of residual tensile strain. Tensile strains can lead to the formation of tension cracks ("subsidence cracks") on the ground surface. After longwall mining has been completed, permanent tension cracks can potentially develop in limited areas around the perimeter of the subsidence troughs, in the areas of residual tensile strain. Although the zone of residual tensile strain (i.e. the zone where subsidence cracking can occur) is located around the perimeter of the longwall panels (and consequently around the perimeter of the subsidence troughs), the exact location and extent of the zone for a particular longwall panel varies depending on the depth of cover, panel and pillar width, and the geology. **Figure 32** shows the perimeter of the longwall panels (i.e. the areas that will experience residual tensile strain).

The majority of the subsided surface area will be unaffected by cracking and there may also be no subsidence cracking above some of the longwall panels because of their significant depth. A monitoring program will be undertaken to identify subsidence cracks and initiate remediation.

Residual tension cracks occur within a few weeks of an area being mined. It is predicted that tension cracks will have a maximum width of up to 0.2 m, and larger cracks may occur in isolated locations. Tension cracking can extend to depths in the order of 10 to 15 m. The extent and magnitude of tension cracks is dependent on the thickness of the near surface strata layers, the soil type, the mining depth, and the level of residual strain.

Transient tension cracks may also form in areas of transient tensile strain above the retreating longwall, however transient cracks typically close again after a short period (within days) as the longwall retreats and the transient subsidence wave and associated transient tensile strain passes.

Subsidence cracking itself is not likely to give rise to significant impacts on vegetation, but subsidence cracks may erode if they are not rehabilitated. A subsidence crack monitoring and rehabilitation program will be established, including:

- Undertaking surveys, within six months of subsidence, to locate individual subsidence cracks.
- Ripping and ploughing minor cracks using a small tractor/dozer.
- Stripping and respreading topsoil, where necessary.
- Undertaking a monitoring program to confirm that the cracks have been successfully rehabilitated and any disturbed vegetation is regenerating.

The proposed subsidence crack rehabilitation program has been designed to limit impacts on vegetation, and no routine clearing of vegetation is proposed as part of the program. Full details of the subsidence crack rehabilitation method, including controls to limit clearing and to ensure the success of rehabilitation is provided in **Section 6**. The areas disturbed by subsidence crack rehabilitation will be monitored to ensure that subsidence crack rehabilitation and revegetation are successful. Disturbance due to subsidence crack rehabilitation is therefore not a permanent impact.

5.3.2 Predicted Disturbance Due to Subsidence Cracking and Crack Rehabilitation

As noted above, subsidence cracks are expected to occur in a discrete area of residual tensile strain around the perimeter of each longwall panel (**Figure 32**). Although the exact location of individual cracks cannot be accurately predicted, the general location within which cracking potentially occurs is well understood.

The area of vegetation predicted to be disturbed by subsidence cracking and subsidence crack rehabilitation has been estimated, and the full results are provided in **Appendix N**.

For the purpose of calculating the area that will be disturbed by subsidence crack rehabilitation, it has been assumed that 50% of the perimeter of the longwall panel will be subject to cracking and require rehabilitation. This is a highly conservative assumption, given that experience from operating mines in the Bowen Basin have shown that cracking as a result of subsidence typically affects less than 20% of the perimeter of the longwall panel. It has also been assumed that rehabilitation will involve clearing a 3 m strip of vegetation centred on the crack. The width of disturbance caused by the subsidence cracking itself is generally predicted to be less than 0.1 m, and the disturbance width has been selected for the purpose of providing access by small earthmoving equipment (e.g. a small tractor or dozer). It should be noted that the vegetation disturbance areas that have been calculated are intended to provide indicative disturbance areas, rather than accurate predictions of disturbance for each vegetation community as it is not possible to accurately predict the location of individual cracks prior to mining. This limitation has, however, been overcome by making use of a conservative prediction method, and assuming cracks along 50% of the perimeter of the longwall panel.

A full description of the calculation methodology is provided in **Appendix N**.

5.3.3 Predicted Vegetation Disturbance

Appendix N presents the areas of remnant vegetation and fauna habitat predicted to be disturbed by subsidence cracking and associated rehabilitation. **Table N.1** in **Appendix N** presents the areas of vegetation disturbance in terms of RE types. A total of approximately 53 ha of remnant vegetation is predicted to be disturbed, over the life of the mine, as a result of vegetation clearing for the repair of subsidence cracks.

This disturbance will occur over approximately 47 years, with progressive rehabilitation occurring to ensure that there is no significant, residual impact. This vegetation disturbance equates to approximately 1% of the total area to be subsided (4,950 ha) (excluding the open cut mine and mine infrastructure area). Disturbed areas will be progressively revegetated, ensuring that there is only a very limited area of impact at any one point in time and no residual impact.

5.3.4 Predicted Disturbance of EPBC Act Threatened Communities

As detailed in **Section 4.3.2**, the study area does not contain any EPBC Act listed vegetation communities and the project will consequently not have any impact on EPBC Act listed communities.

5.3.5 Predicted Disturbance of Queensland Listed Vegetation Communities

The majority of vegetation (51 ha [**Table N.1** in **Appendix N**]) that will potentially be disturbed is categorised as Least Concern under the VM Act. There will potentially be only very limited disturbance of Of Concern vegetation (RE 10.10.3), amounting to approximately 2 ha (**Table N.1** in **Appendix N**). This disturbance will take place over a period of decades, with rehabilitation being progressively undertaken, and consequently no significant impact is predicted.

5.3.6 Predicted Impacts of EPBC Act Threatened Fauna Species

The vegetation listed in **Table N.1** in **Appendix N** provides habitat for a number of threatened fauna species. These are listed in **Table 5.4** and **Table N.2** in **Appendix N**. Please note that the areas in **Table 5.4** cannot be added to each other, or to the areas in **Table N.1** in **Appendix N** given that there is an overlap in the high value habitat for various species. As noted above, only *a total* of approximately 53 ha of remnant vegetation is predicted to be disturbed by subsidence cracking rehabilitation over the 47 year longwall mining life.

Table 5.4 Summary of High Value Habitat Disturbed due to Repair of Subsidence Cracks

Species	Conservation Status[1]		High Value Habitat in the Project Site (ha)^	High Value Habitat Disturbance (ha) Due to Repair of Subsidence Cracks	Disturbed (%)
	EPBC Act	NC Act[2]			
Squatter Pigeon (southern subspecies)	V	V	2,004	8.3	0.4
Black-throated Finch (white-rumped subspecies)	E	E	2,632.2	9.8	0.4
Australian Painted Snipe	E	E	123.2	0.03	0.02
Koala	V	SLC	3,632	21	0.6

[1] Threatened and/or Special Least Concern species status under the EPBC Act and/or NC Act (current at 6 March 2015).
E = Endangered; V = Vulnerable; SLC = Special Least Concern (non-migratory).

[2] Excludes Special Least Concern (migratory) species.

^ Excludes the area that would be cleared as a result of the open cut mining area and associated mine infrastructure area.

The areas of habitat disturbance are small, particularly given that the disturbance will take place over a longwall mine life of approximately 47 years, and vegetation will be progressively rehabilitated. As shown in **Table 5.4**, the areas that will be disturbed are very small relative to the area of habitat remaining on the project site (less than 1% for all species).

It is considered that potential impacts due to subsidence crack rehabilitation would not result in significant, residual impacts on any fauna species, given the impact is small scale and temporary, and also given there are large amounts of high value habitat available within the project site. The data in **Table 5.4** supports this conclusion that subsidence cracking and crack rehabilitation will not have a significant impact on threatened fauna species listed under the EPBC Act.

A vegetation monitoring program will be undertaken to confirm that subsidence does not give rise to impacts greater than those listed in **Table 5.4** and to identify additional mitigation measures in the event of unanticipated impacts. Further detail is provided in **Section 6**.

5.3.7 Predicted Impacts on Queensland Listed Threatened and/or Special Least Concern Fauna Species

As shown in **Table 5.4**, all of threatened fauna species listed under the EPBC Act are also threatened under the NC Act. The Squatter Pigeon (southern subspecies) is listed as Vulnerable under the NC Act, the Black-throated Finch (white-rumped subspecies) is listed as Endangered under the NC Act, the Australian Painted Snipe is listed as Endangered

under the NC Act and the Koala is listed as Special Least Concern under the NC Act. The impacts to high value habitat for these species as a result of remnant vegetation disturbed by subsidence cracking rehabilitation over the 47 year longwall mining life are detailed in **Section 5.3.6** and listed in **Table 5.4.**

High value habitat for one additional species, the Short-beaked Echidna, listed as Special Least Concern under the NC Act, will also be disturbed due to subsidence crack rehabilitation (**Figure 31**). Approximately 24.2 ha of high value habitat for the Short-beaked Echidna will disturbed by subsidence crack rehabilitation (**Appendix N**). This represents a clearing of approximately 0.5% of total remaining high value habitat for this species within the study area (excluding the area that would be cleared as a result of the open cut mine and mine infrastructure area).

As described in **Section 5.3.6**, it is considered that potential impacts due to subsidence crack rehabilitation would not result in significant, residual impacts on any fauna species, given the impact is small scale and temporary, and also given there are large amounts of high value habitat available within the study area. Subsidence cracking and crack rehabilitation will not have a significant impact on threatened fauna species listed under the NC Act.

A vegetation monitoring program will be undertaken to confirm that subsidence does not give rise to impacts greater than those listed to the Short-beaked Echidna above and to identify additional mitigation measures in the event of unanticipated impacts. Further detail is provided in **Section 6**.

5.4 Drainage Changes Due to Subsidence

5.4.1 Overview of Impact

As indicated in **Section 5.3**, longwall mining will give rise to subsidence (i.e. the progressive formation of gentle trough-like depressions on the surface relative to the natural topography). Subsidence troughs can alter surface drainage paths, which may lead to the ponding of water in localised shallow surface depressions. Subsidence ponding will be mitigated by the installation of minor remedial drainage earthworks to re-establish free drainage. Drainage works may include the construction of excavated trapezoidal drainage channels with stable batter slopes, and designed with sufficient capacity to cater for contributing catchments. These channels would enable free drainage of subsidence depressions. Drainage channels will be located to avoid sensitive features and vegetation communities, as far as practicable.

With the installation of minor remedial drainage earthworks and the re-instatement of free drainage, there will be no significant residual ponding caused by mine subsidence and consequently no impact on vegetation due to ponding of water. The EIS Subsidence Section includes a commitment to monitor the areas above longwall panels to confirm that the installation of remedial drainage works has been successful in ensuring that free drainage is re-established.

The key potential effect on vegetation due to changes in drainage therefore relates to the clearing of vegetation for the construction of minor remedial drainage earthworks and further detail on this impact is provided in **Sections 5.4.2** to **5.4.7**.

Subsidence may also give rise to changes in the extent and ecological functioning of the Northern Seasonal Wetland. This impact is discussed in the EIS Aquatic Ecology and Stygofauna Report. This report explains that mitigation measures to minimise impacts to this wetland will be outlined in the project Subsidence Management Plan. Measures include accurate ground survey of the wetland; a detailed assessment of the potential impacts of subsidence on the wetland (based on the mine plan developed as part of more detailed mine planning) and prescriptions for the installation of remedial works to limit any impacts on the wetland.

5.4.2 Predicted Disturbance Due to Construction of Drains

Figure 33 shows the location of proposed minor remedial drains relative to vegetation in the study area. This figure is based on the post-subsidence landform generated from the subsidence model prepared for the project. The EIS Subsidence Report describes how these predictions were generated.

The proposed minor remedial drains were superimposed on the RE mapping and habitat mapping to enable the area disturbed by the construction of drains to be calculated. It is not possible at this stage to develop detailed designs for each individual drain. Preliminary drain designs have been developed based on the predicted post-subsidence surface contours for the purpose of estimating vegetation disturbance areas, based on a typical average drain cross-section and gradient (**Figure 33**). These drains have a cross-section with a 2 m wide base and 3H:1V batter slopes. Drains will be grassed.

5.4.3 Predicted Vegetation Disturbance

Table O.1 in **Appendix O** provides a summary table showing a conservative estimate of the total area of remnant vegetation cleared for the construction of minor remedial drains. As indicated in **Table O.1** in **Appendix O**, only a small area of vegetation (approximately 12 ha) will be cleared by the construction of remedial drainage works, and this disturbance will occur progressively over the life of the mine (approximately 47 years). Vegetation clearing associated with the construction of minor remedial drainage works would mostly occur during the later years of the mine life.

In addition to clearance associated with remedial drains, a small bund (approximately 1 m in height, 3 m wide along the crest, and 460 m long) will also have to be constructed adjacent the Northern Seasonal Wetland to ensure that this wetland does not drain eastward as a result of potential subsidence impacts. This would include the disturbance of 0.7 ha of vegetation comprising 0.14 ha of RE 10.5.1a: *Eucalyptus similis* open-woodland on sand plains and 0.54 ha of RE 10.7.12a: *Eucalyptus drepanophylla* open-woodland on ferricrete. These two REs are both listed as Least Concern under the VM Act.

5.4.4 Predicted Disturbance of EPBC Act Threatened Communities

As detailed in **Section 4.3.2**, the study area does not contain any EPBC Act listed vegetation communities and the project will consequently not have any impact on EPBC Act listed communities.

5.4.5 Predicted Disturbance of Queensland Listed Vegetation Communities

All of the vegetation that will be cleared for the construction of remedial drains is classified as Least Concern under the VM Act (**Appendix N**).

5.4.6 Predicted Impacts on EPBC Act Threatened Fauna Species

The vegetation listed in **Table O.1** in **Appendix O** provides habitat for a number of threatened fauna species, as listed in **Table 5.5** and **Table O.2** in **Appendix O**. Please note that the areas in **Table 5.5** cannot be added to each other, or to the areas in **Table O.2** in **Appendix O**, given that high value habitat has been based not only on RE types but also specific habitat features based on different landforms (i.e. rocky habitats, etc.). As noted above, only *a total* of approximately 12 ha of remnant vegetation will be cleared for the construction of remedial drains over the life of the mine. As shown in **Appendix O**, the areas that will be disturbed are very small relative to the area of habitat remaining on the project site (less than 1% for most species).

Table 5.5 Summary of High Value Habitat Disturbed due to Construction of Remedial Drains

Species	Conservation Status[1]		High Value Habitat in the Project Site (ha)^	High Value Habitat Disturbance (ha)	Disturbed (%)
	EPBC Act	NC Act[2]			
Squatter Pigeon (southern subspecies)	V	V	2,004	3.2	0.2
Black-throated Finch (white-rumped subspecies)	E	E	2,632.2	9.2	0.3
Australian Painted Snipe	E	E	123.2	2.7	2.2
Koala	V	SLC	3,632	0.4	0.01

[1] Threatened and/or Special Least Concern species status under the EPBC Act and/or NC Act (current at 6 March 2015).

E = Endangered; V = Vulnerable; SLC = Special Least Concern (non-migratory).

[2] Excludes Special Least Concern (migratory) species.

^ Excludes the area that would be cleared as a result of the open cut mine area and associated mine infrastructure area.

5.4.7 Predicted Impacts on Queensland Listed Threatened and/or Special Least Concern Fauna Species

As shown in **Table 5.5**, all of threatened fauna species listed under the EPBC Act are also threatened under the NC Act. The Squatter Pigeon (southern subspecies) is listed as Vulnerable under the NC Act, the Black-throated Finch (white-rumped subspecies) is listed as Endangered under the NC Act, the Australian Painted Snipe is listed as Endangered

under the NC Act and the Koala is listed as a Special Least Concern fauna species under the NC Act. The impacts to high value habitat for these species as a result of remnant vegetation disturbed due to the construction of remedial drains over the 47 year longwall mining life are detailed in **Section 5.4.6** and listed in **Table 5.5.**

High value habitat for one additional species, the Short-beaked Echidna, listed as Special Least Concern under the NC Act, will also be disturbed due to the construction of remedial drains. Approximately 12 ha of high value habitat for the Short-beaked Echidna will be disturbed due to the construction of drains (**Appendix O**). This represents a clearing of approximately 0.2% of total remaining high value habitat for this species within the study area (excluding the area that would be cleared as a result of the open cut mine area and mine infrastructure area).

5.5 Indirect Impacts

5.5.1 Noise and Vibration

The project is likely to generate significant noise during construction of infrastructure and through routine mining operations. Examples of noise can come from large mining trucks, excavation machinery, noise from blasting used during the mining phase, and the noise from generators and machinery used in the daily operation of the mine and processing plant.

Some fauna species are sensitive to elevated levels of noise in their environment and this has the potential to impact negatively on these species (AMEC, 2005). Noise can affect animal physiology and behaviour, and if it becomes an ongoing stress, it can be injurious to an animal's energy budget, reproductive success and long-term survival. There are other potential effects that include habitat loss through avoidance and a retreat away from favourable habitats (AMEC, 2005).

Noise also affects the way that animal-created sounds are heard and interpreted by other animals. This can include mating calls, territorial calls and alarm calls. Interference with these calls by noise created by the mine has the potential to disrupt the species relying on these calls with deleterious results including reduced reproductive success and mortality (AMEC, 2005).

The noise created by the construction and operation of the mine is likely to affect native species and affect the value of the habitats that remain. Some species are likely to move in response to noise and therefore the habitat value of the woodlands remaining in the immediate vicinity of the open cut mine and mine infrastructure areas may decrease. This has the effect of increasing the amount of habitat for native species that will be disturbed as a result of the project. However, it is likely that most animal species will habituate to noise disturbance (AMEC, 2005), and the project is likely to only cause temporary disturbance to fauna. Furthermore, the impacts from noise emissions are likely to be localised close to the open cut mine area and mine infrastructure area (up to 100 m) and are not likely to have a significant, long-term impact on wildlife populations.

Noise will diminish within areas that are progressively rehabilitated and, in the long term, noise levels will return to normal following rehabilitation of the total mined area and cessation of mining.

5.5.2 Vehicle Strike

Vehicle strike can pose a significant risk to some wildlife, particularly but not exclusively to ground dwelling species (Taylor and Goldingay, 2010). Koalas are particularly at risk from vehicle strike as they frequently cross roads and tracks while moving between individual trees or from one patch of habitat to another.

The project will result in the construction of additional roads and tracks which means an increased length of road for animals to cross and navigate, as well as a significant increase in the number of vehicles operating in the study area. Vehicle strikes may also occur during the operation of the mine with vehicles entering and leaving the open cut mine and mine infrastructure areas as well as during the normal daily movements of workers and vehicles throughout the study area.

These changes are likely to increase the likelihood of vehicle strikes on native fauna, with an associated increase in mortality. However, although some mortality of animals as a result of vehicle strike is likely, it is not expected to be significant. Speed limits along internal roads, appropriate signage and careful driving policies will increase the awareness of drivers and decrease the risk of vehicles striking fauna. The risk of vehicle strike will diminish following rehabilitation of the total mined area and cessation of mining.

5.5.3 Light

The project will increase the level of artificial night light in the natural environment as work will be conducted 24hours/day. Sources of night light will come from light from buildings, vehicle headlights and floodlighting of work areas. Increased light levels may adversely impact wildlife by direct glare, chronic or periodic increased illumination and temporary unexpected fluctuations in light levels (Longcore and Rich, 2004; Saleh, 2007).

Research into impacts from altered lighting (Longcore and Rich, 2010) indicates that it can trigger behavioural and physiological responses that include but are not limited to:

- Changes in foraging behaviour, such as when diurnal species begin foraging during night-time;
- A disruption of seasonal day length cues which trigger critical behaviours (Longcore and Rich, 2004; Saleh, 2007; Longcore and Rich, 2010);
- Disorientation and/or temporary blindness; and
- Interference with predator-prey relationships.

While increased levels of night lighting will have some effect on the surrounding woodland environment, the impacts from night light pollution are likely to remain close to the immediate boundary of the open cut mine and mine infrastructure areas, with only limited glare into the

surrounding natural vegetation. Detailed design will ensure that lighting will be directed away from high value habitat areas and are described in the EIS Noise Report. It is likely that most fauna species would habituate to the levels of light pollution from the mine, and it is unlikely to have a significant or long-term impact on any fauna species.

Artificial light will diminish within areas that are progressively rehabilitated and, in the long term, light levels will return to normal following rehabilitation of the total mined area and cessation of mining.

5.5.4 Dust

Construction and mining activities have the ability to generate dust, which may impact on the ecology within the study area in a number of ways. Dust that settles can accumulate on leaf surfaces and reduce essential physiological processes including photosynthesis, respiration, and transpiration (Farmer, 1993). Dust can also produce physical effects on plants such as blockage and damage to stomata, shading, and abrasion of leaf surface or cuticle. Decreased growth and vigour of plants may mean that they are more susceptible to pathogens and other disturbance, and these plants are more likely to be subject to increased mortality. Such impacts to individual plants generally result in decreased productivity and can result in changes in vegetation and community structure (Farmer, 1993).

The effect of dust deposition also affects animals that use plants, either as a source of food or habitat. Dust on the foliage and fruit may reduce palatability to animals and decreased health of trees and changed community structure results in a reduction in the amount of available habitat.

Dust pollution can lead to a decrease in habitat quality which has the potential to extend the area of impact beyond the area directly disturbed by the mine. Increased levels of dust could impact vegetation within woodland communities, reducing health of some species along the edge of mined areas and roads. It could also impact upon potential foraging resources for wildlife, including Koalas, threatened birds and bats. That notwithstanding, dust will diminish within areas that are progressively rehabilitated and, in the long term, dust levels will return to normal following rehabilitation of the total mined area and cessation of mining. Standard dust minimisation strategies such as watering haul roads will be implemented to minimise the creation of dust. These are described in the EIS Air Quality Report. In the context of the scale of the project, dust is not considered likely to cause a significant impact on the ecological values of the study area.

5.5.5 Erosion and Sedimentation

The project has the potential to increase the amount of erosion occurring in the study area through the clearing of vegetation and construction of roads, tracks, and infrastructure. The effects of erosion can already be seen in places within the study area, particularly along ephemeral drainage lines, caused by stock. The study area is located in a sub-tropical climate, and during the wet season, large volumes of rainfall and can wash away any disturbed earth relatively easily. This has the potential to increase sedimentation and turbidity of ephemeral drainage lines.

The project will result in a significant amount of soil disturbance, both for the mine and the creation of roads and tracks throughout the study area, with an associated increase in the potential for erosion and consequent impacts. Erosion is also likely to be exacerbated by any kind of vegetation clearance for the open cut mine and mine infrastructure areas as vegetative cover is known to stabilise soils.

Erosion and sediment controls will be established to minimise the amount of erosion and consequent impacts of the project. These controls are discussed in the EIS Surface Water Section and will be described in an Erosion and Sediment Control Plan. With the implementation of appropriate measures, it is unlikely that erosion will significantly affect the ecology of the study area.

5.5.6 Feral Animals and Weeds

Alterations to habitat conditions often favour introduced and/or hardy native plant and animal species that can proliferate in disturbed conditions. Such species have potential to impact upon the original local native plant and animal species. Introduced pasture grasses such as Buffel Grass and other introduced plants have potential to out-compete regenerating native plant species. Feral animals such as pigs, foxes, rabbits and some species of birds can also breed in the more open areas following clearance of forest and woodland. They can cause problems for native fauna species by preying upon them or by competing with them for food and resources.

Although the project has the potential to increase the numbers of feral animals, the study area already contains a range of feral animals, including feral pigs and cats. Feral pigs are known to prey on frogs, reptiles, birds and small mammals (DEH, 2005) as well as degrade habitat by:

- Feeding selectively on plant communities;
- Creating drainage channels in swamps;
- Eroding soil and fouling watering points with their wallowing; and
- Spreading weeds and possibly disease, such as foot and mouth disease.

Feral animals such as wild dogs and feral pigs are currently controlled in the study area to mitigate the impacts of these species on livestock. It will be necessary to ensure that controls of these species are continued, and enhanced, during the operation of the project.

A Feral Animal and Weed Management Plan (**Section 6.3.2**) will be prepared to mitigate the potential impacts of weeds and feral animals. This will include provision for the implementation of appropriate control measures including monitoring and population reduction. With the implementation of these measures, it is unlikely that feral animals or weeds will have a large impact on the ecology of the study area.

5.6 Duration and Timing of Impacts

The duration and timing of the impacts of the project has important effects on the magnitude of the overall impacts on the ecology of the study area.

The total or net impacts of the project will not occur simultaneously as the mining will be staged and rehabilitation will be progressive. Woodlands will be progressively cleared by the project; however, areas of woodland will be re-established in the rehabilitation, with the primary aim of restoring them to the previously occurring woodland communities. In particular, native trees and shrubs will be planted on the plateau areas of overburden emplacement. Further detail in rehabilitation is provided in the EIS Rehabilitation Section.

This means that for much of the life of the mine, the majority of the study area will be vegetated, although rehabilitated mine areas will have immature vegetation. These young rehabilitated areas will still represent habitat for some fauna species, including woodland birds, and play an important role in maintaining habitat areas as the project progresses. Thus the net loss of vegetation at a given stage of the project will be minimised through the progressive clearance and concurrent rehabilitation of the mined land within the study area.

5.7 Impacts of Climate Change

There is potential for climate change to cause changes in habitat, as changed climatic conditions will favour some kinds of environments over others. This will lead to changes in the distribution of habitat which will in turn affect the distribution of native species. Areas most at risk are the wet tropics in Queensland and the alpine areas that will change significantly if temperatures rise according to predictions.

Climate change may happen too quickly for some species to adapt and may exacerbate existing threats such as land clearance, farming and pollution. Species with biological traits that make them susceptible to change, or with restricted habitats, are particularly vulnerable to extinction, as they will have nowhere to go if their habitats are rendered unsuitable.

The project will result in the reduction of habitat for native species, which may indirectly exacerbate any reduction in habitat caused by climate change. However, it is unclear whether the habitats present in the study area are susceptible to climate change. As well as reducing the extent of some communities and habitats, climate change can also facilitate the expansion of other habitats, and some species will increase their distribution as a result. There are large areas of similar habitat in the locality that is similar to the habitat present in the study area, and it is not expected that the reduction of habitat as a result of the project would significantly exacerbate the effects of climate change in the locality.

5.8 Cumulative Impacts

Cumulative impacts result when many small-scale alterations to the environment combine to cause an overall greater level of impact. In a mining environment, cumulative impacts can arise from the compounding activities of a single operation or multiple mining and processing

operations in the same area, as well as the interaction of mining impacts with other past, current and future activities that may not be related to mining (Franks *et al.*, 2008).

Cumulative impacts can arise from either persistent losses of one resource, or the compounding effects of two or more impacts (Lindenmayer and Fischer, 2006). Direct and indirect impacts that may be considered insignificant on their own may be significant when considered together with other actions being undertaken as part of the project, or with other similar projects in the locality.

The main impact to biodiversity that will occur as a result of the project is the clearance of native vegetation that provides habitat for a range of native species. Although some impacts have already occurred in the locality and region as a result of agriculture, including some vegetation clearance and grazing, no large-scale vegetation clearance has taken place, and the majority of the vegetation in the region is remnant.

The project is located at the eastern edge of the Desert Uplands Bioregion (**Figure 3**). At present, disturbance in the bioregion includes grazing, the presence of rural roads and a number of small towns. However, the Galilee Coal Basin occurs within this bioregion and a number of large-scale coal mines are proposed to be developed. These are shown on **Figure 3** and include the CCM&RP, Kevin's Corner Coal Project, Alpha Coal Project, Galilee Coal Project and South Galilee Coal Project. Each of these projects will have a significant disturbance footprint, and these projects will have cumulative ecological impacts on biodiversity in the region by clearing substantial areas of vegetation and habitat. Cumulative impacts of future development in the locality of the project will likely include both direct and indirect impacts on flora and fauna as habitats are further reduced and fragmented. Likely short to medium term cumulative impacts are those relevant to mining operations, such as noise, light and dust impacts. Long term cumulative impacts include loss of habitat, habitat fragmentation and edge effects.

However, the identification and management of cumulative impacts has the potential to benefit regional environments, as integrated mitigation strategies can have greater benefit than individual mitigation measures implemented by each project (Franks *et al.*, 2008). This may include strategic rehabilitation of corridors, or substantial investment in recovery plans for affected species. Despite the land clearance predicted to take place, all of the aforementioned projects offer mitigation or compensatory measures, including proposals to rehabilitate mined areas. The mined landscapes will be progressively returned as flora and fauna habitat in the medium to long term. Additionally, all of the mines have provisions for offsetting ecological impacts. Projects will be required to secure additional surrounding lands that contain forest, woodland and derived native grasslands as offsets. These offsets will collectively and significantly increase the total area of native vegetation within conservation reserves in the locality and the region. Proposed combined offsets cover a large area (over 100,000 ha).

In order to ensure that offsets provide maximum conservation benefits, the Queensland government has developed the Galilee Basin Offset Strategy (EHP, 2013). The strategy seeks to replace environmental values which may be lost in the Galilee Basin as a result of development (EHP, 2013). Specifically, the strategy aims to identify sites which have the potential to provide alternative habitats and increase the long-term viability of the area's

conservation values and biodiversity. The strategy aims to identify the best strategic locations in central Queensland where environmental offsets can be established in order to provide long-term, environmental outcomes for the region (EHP, 2013).

A comprehensive biodiversity offset strategy will be prepared for the project as outlined in **Section 7**. The offsetting arrangements will both protect existing forest and woodland communities and restore vegetation, with the net result being an increase in total woodland vegetation and an increase in such vegetation under conservation tenures. As discussed above, the cumulative impacts in the area are likely to be adequately offset by the cumulative benefits of offsetting from several projects.

5.9 Summary of Impacts

The project would result in the clearing of approximately 11,000 ha of native vegetation consisting predominantly of widespread forms of woodland and shrubland. No ecological communities listed under the EPBC Act are present in the study area or would be impacted by the project. A small area of approximately 24 ha of vegetation listed as Of Concern under the VM Act would be cleared.

Table 5.6 presents a summary of the predicted impacts to Of Concern REs listed under the VM Act, and threatened/Special Least Concern fauna species listed under the EPBC Act and/or NC Act that have been recorded from the study area and those that are considered to have either a high or moderate likelihood of occurrence.

Table 5.6 Summary of Impacts to Threatened REs and Threatened, Special Least Concern and/or Migratory Species Recorded from the Study Area or with Potential to Occur

Scientific Name	Common Name	Conservation Status[1]		Likelihood of Occurrence	Impacts of the Project
		EPBC Act	NC Act[2]		
REGIONAL ECOSYSTEMS					
RE 10.10.3	*Eucalyptus drepanophylla* open-woodland on sandstone ranges	-	Of Concern	Present	The project would result in: • Approximately 24 ha of RE 10.10.3 being cleared for open cut mining and the construction of mine infrastructure; and • Approximately 2 ha being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
FAUNA					
Threatened Birds					
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	Vulnerable	Vulnerable	Present	The project would result in: • Approximately 1,436 ha of high value habitat for the Squatter Pigeon (southern subspecies) being cleared for open cut mining and the construction of mine infrastructure; • Approximately 3 ha of high value habitat for the Squatter Pigeon (southern subspecies) being cleared for the construction of remedial drains; and • Approximately 8 ha of high value habitat for the Squatter Pigeon (southern subspecies) being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.

Scientific Name	Common Name	Conservation Status[1]		Likelihood of	Impacts of the Project
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	Endangered	Endangered	Present	The project will result in: • Approximately 4,434 ha of high value habitat for the Black-throated Finch (white-rumped subspecies) being cleared for the open cut mine and mine infrastructure areas; • Approximately 9 ha of high value habitat for the Black-throated Finch (white-rumped subspecies) being cleared for construction of remedial drains; and • Approximately 10 ha of high value habitat for the Black-throated Finch (white-rumped subspecies) being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Rostratula australis	Australian Painted Snipe*	Endangered	Endangered	Moderate	The project will result in: • Approximately 12 ha of high value habitat for the Australian Painted Snipe being cleared for the open cut mine and mine infrastructure areas; • Approximately 3 ha of high value habitat for the Australian Painted Snipe being cleared for the construction of remedial drains; and • Approximately 0.03 ha of high value habitat for the Australian Painted Snipe being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Migratory Birds					

Scientific Name	Common Name	Conservation Status[1]		Likelihood of	Impacts of the Project
Apus pacificus	Fork-tailed Swift	Migratory, Marine	-	High	The project would result in: • Approximately 10,998 ha of high value habitat for the Fork-tailed Swift being cleared for open cut mining and the construction of mine infrastructure; • Approximately 12 ha of high value habitat for the Fork-tailed Swift being cleared for the construction of remedial drains; and • Approximately 53 ha of high value habitat for the Fork-tailed Swift being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Ardea ibis	Cattle Egret	Migratory, Marine	-	High	The project would result in: • Approximately 10,998 ha of high value habitat for the Cattle Egret being cleared for open cut mining and the construction of mine infrastructure; • Approximately 12 ha of high value habitat for the Cattle Egret being cleared for the construction of remedial drains; and • Approximately 53 ha of high value habitat for the Cattle Egret being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Ardea modesta	Eastern Great Egret	Migratory, Marine+	-	High	The project would result in: • Approximately 12 ha of high value habitat for the Eastern Great Egret being cleared for open cut mining and the

Scientific Name	Common Name	Conservation Status[1]		Likelihood of	Impacts of the Project
					construction of mine infrastructure; • Approximately 3 ha of high value habitat for the Eastern Great Egret being cleared for the construction of remedial drains; and • Approximately 0.03 ha of high value habitat for the Eastern Great Egret being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Gallinago hardwickii	Latham's Snipe	Migratory, Marine	-	Moderate	The project would result in: • Approximately 12 ha of high value habitat for the Latham's Snipe being cleared for open cut mining and the construction of mine infrastructure; • Approximately 3 ha of high value habitat for the Latham's Snipe being cleared for the construction of remedial drains; and • Approximately 0.03 ha of high value habitat for the Latham's Snipe being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Merops ornatus	Rainbow Bee-eater	Migratory, Marine	-	Present	The project would result in: • Approximately 10,998 ha of high value habitat for the Rainbow Bee-eater being cleared for open cut mining and the construction of mine infrastructure; • Approximately 12 ha of high value habitat for the Rainbow Bee-eater being cleared for the construction of remedial

Scientific Name	Common Name	Conservation Status[1]		Likelihood of	Impacts of the Project
					drains; and • Approximately 53 ha of high value habitat for the Rainbow Bee-eater being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Myiagra cyanoleuca	Satin Flycatcher	Migratory, Marine	-	Present	The project would result in: • Approximately 10,998 ha of high value habitat for the Satin Flycatcher being cleared for open cut mining and the construction of mine infrastructure; • Approximately 12 ha of high value habitat for the Satin Flycatcher being cleared for the construction of remedial drains; and • Approximately 53 ha of high value habitat for the Satin Flycatcher being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Mammals					
Phascolarctos cinereus	Koala	Vulnerable	Special Least Concern	Present	The project would result in: • Approximately 3,246 ha of high value habitat for the Koala being cleared for open cut mining and the construction of mine infrastructure; • Approximately 0.4 ha of high value habitat for the Koala being cleared for the construction of remedial drains; and

Scientific Name	Common Name	Conservation Status[1]		Likelihood of	Impacts of the Project
					• Approximately 21 ha of high value habitat for Koala being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.
Tachyglossus aculeatus	Short-beaked Echidna	-	Special Least Concern	Present	The project would result in: • Approximately 10,880 ha of high value habitat for the Short-beaked Echidna being cleared for open cut mining and the construction of mine infrastructure; • Approximately 12 ha of high value habitat for the Short-beaked Echidna being cleared for the construction of remedial drains; and • Approximately 24 ha of high value habitat for the Short-beaked Echidna being disturbed due to subsidence crack rehabilitation. This vegetation would be progressively rehabilitated, ensuring that there is no residual impact due to subsidence crack rehabilitation.

1 Threatened, migratory and/or marine species status under the NC Act and/or EPBC Act (current at 6 March 2015).

2 Excludes Special Least Concern (migratory) species.

* Species listed as Threatened under the EPBC Act as Painted Snipe (*Rostratula australis*) (sensu lato).

\+ Species listed as a marine species under the EPBC Act as Great Egret (*Ardea alba*).

CUMBERLAND ECOLOGY

Chapter **6**

Mitigation and Management Measures

The purpose of this section is to outline the mitigation and compensation measures proposed to ameliorate the impacts of the project on flora and fauna. As demonstrated in previous sections, the study area is biodiverse and provides habitat for a wide range of flora and fauna, including threatened fauna species listed under the EPBC Act and/or the NC Act, and potential habitat for several more fauna species. As discussed in **Section 5**, the project will remove a small amount of Of Concern vegetation listed under the VM Act and will impact the threatened species through the clearing of high value habitat, subsidence from underground mining and a range of indirect impacts.

This section outlines a range of impact mitigation measures that will be implemented for the project, including measures to avoid, mitigate and compensate for impacts, particularly the removal of habitat. This includes minimising vegetation clearance, pre-clearance surveys, mine rehabilitation and a suite of management and monitoring plans that will ensure biodiversity values present in the study area are appropriately managed in the long term, and that threats to biodiversity such as feral animals and weeds are managed. Furthermore, an ecological monitoring program will be established to monitor the ongoing status and health of flora and fauna communities that will be retained within the study area in order to assess the success of the mitigation and compensation measures.

6.1 Measures to Avoid Impacts

Open cut mining projects cannot readily avoid impacts to biodiversity where mineral resources are beneath flora and fauna habitats. However, avoidance of impacts has been achieved to the extent possible by modification of the design and location of the open cut mining area and associated mine infrastructure away from natural habitats, where feasible. In particular, as detailed in the EIS Aquatic and Stygofauna Ecology Report, the open cut mine plan has been designed to avoid disturbance to the drainage line that runs north of the open cut mining area (**Figure 25**). This is one of the large drainage lines in the study area.

6.2 Measures to Mitigate Impacts

The following impact mitigation measures will be implemented to mitigate the direct and indirect impacts of the construction and operation of the project.

6.2.1 Minimising Vegetation and Habitat Loss

In order to minimise clearing impacts and unnecessary disturbance to native vegetation, the following procedures will be implemented:

- The limits of clearing will be delineated prior to the commencement of any clearing and marked clearly on plans and on the ground;
- Vegetation beyond the identified clearing areas will not be disturbed; and
- Vegetation clearing will be undertaken sequentially and in accordance with the proponent's Permit to Disturb process. This will restrict the area of vegetation to be cleared to that required for the safe construction and operation of facilities.

6.2.2 Pre-clearing Surveys

Pre-clearing surveys will be undertaken ahead of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated. Pre-clearing protocols will include:

- Preparation of an inventory of trees and hollows to be removed and relocated, prior to clearing;
- Checking hollow-bearing trees for the presence of bird nests and arboreal mammals, such as possums, gliders and bats, prior to felling;
- Animals found to be occupying trees and habitat will be safely removed before the clearing of trees and relocated into nearby woodlands;
- Salvaged tree hollows will be provided in nearby woodland to compensate for the hollows to be removed due to vegetation clearance; and
- Boulders and large logs will be placed in nearby areas of retained vegetation to allow their continued use as fauna habitat.

A Spotter Catcher, in possession of relevant permits under the NC Act, will be on hand to supervise clearing and to rescue any animals still remaining in the clearing area following the pre-clearance surveys. The Spotter Catcher will handle any animals injured during the process and will determine whether veterinary help is needed. If appropriate, animals will be taken to the nearest veterinary surgeon for treatment; however if the injuries are too severe, the ecologist will humanely euthanize any injured animal according to the appropriate protocols.

6.2.3 Vegetation Conservation and Management

In order to maximise the conservation of biodiversity, and mitigate the impacts of the project, as much existing vegetation as possible will be retained in the study area. Areas of native vegetation in the study area, outside of the footprint of the open cut mining area and the mine infrastructure area, will be managed to conserve and enhance their conservation value.

The following measures will be implemented to retain and enhance the habitat values of the study area:

- Measures to manage weeds and feral animals, in accordance with the requirements of a Feral Animal and Weed Management Plan;
- Inclusion of logs, dead trees, stumps and hollows in strategic locations to enhance fauna habitat;
- Management of grazing pressure in the study area;
- Implementation of a fire management plan, designed to enhance biodiversity values (whilst also ensuring that risks to human safety and property due to bushfire are managed);
- Provision of fauna watering points. A key limiting factor for native species in the study area is the lack of permanent water. This is especially true for some of the threatened seed eating bird species including the Black-throated Finch (white-rumped subspecies) and the Squatter Pigeon (southern subspecies) that must drink every day. During the wet season, water is usually abundant, however during the dry season, the ephemeral drainage lines dry out and few are deep enough to hold water throughout the dry season. High value habitat for the Black-throated Finch (white-rumped subspecies) and the Squatter Pigeon (southern subspecies) is defined in relation to distance from a permanent water source. During the dry season, due to the lack of water in the landscape, areas of suitable habitat are reduced. One way to extend the areas of high value habitat for these species is to provide a network of water sources in areas that currently do not contain water in the dry season. These will include cattle troughs, and areas of aquatic habitat created through excavating pools to provide a deeper reservoir of water. Such watering points will be fenced to prevent access by cattle. Areas of aquatic habitat will be designed to have:
    - A deep section that provides a suitable reservoir of water that will persist into the dry season;
    - A large, shallow area that is inundated during the wet season;
    - Presence of a diversity of fringing vegetation such as sedges, rushes and reeds; and
    - Canopy tree species nearby.

Creating watering points with these habitat features is considered to be achievable, given that these values are all present in the southern farm dam, an artificial structure.

These measures will be described in a Biodiversity Management Plan. The plan will also describe the monitoring work that will be undertaken to confirm the effectiveness of these measures.

The Biodiversity Management Plan will also detail the pre-clearing survey protocols (as summarised in **Sections 6.2.1** and **6.2.2**).

6.2.4 Rehabilitation of Subsidence Cracking

The subsidence crack rehabilitation program will involve the visual inspection of potential residual tension cracking areas around the perimeter of the active panel subsidence troughs on a monthly basis during the extraction of each longwall panel. The purpose of these inspections will be to identify cracks and buckling. Visual inspections will include recording of GPS locations of any cracks and buckling. In the event that significant erosion potential is identified during inspections, subsidence crack rehabilitation work may be required or temporary erosion and sediment control measures will be implemented. This may include the installation of temporary drainage diversion to control erosion potential.

Two months following the completion of each longwall panel, crack locations will be inspected and assessed for the level of treatment required to rehabilitate each crack.

The method has been designed in order to minimise disturbance of vegetation and is consistent with the method successfully used at a number of operating mine sites. Given that the majority of the study area is open woodland, in several instances it will be possible to gain access to the area for crack repair without any need for clearing large trees.

The subsidence crack rehabilitation program is as follows:

1. A survey of potential subsidence cracking areas will be undertaken within six months of subsidence to locate individual cracks and assess the level of treatment required to rehabilitate each crack. Six months will allow sufficient time for the full effects of subsidence to take place and ensure that remedial works are not undertaken prematurely before the full development of all the surface subsidence effects. Subsidence crack treatment will involve:

    - Ripping or ploughing minor cracks (<200 mm width) using a small tractor or dozer. These areas will be allowed to regenerate naturally through inherent seed resources, vegetation propagation from rootstock and recruitment from adjoining undisturbed edges.

    - Stripping large cracks (>200 mm width) of topsoil, excavating and backfilling the cracks. Topsoil will then be replaced over the area and the site will be allowed to regenerate naturally from the seed bank and root stock in the topsoil. Areas disturbed as part of the crack rehabilitation program will generally comprise a narrow strip typically up to 2 to 3 m wide and for the length of the crack (typically up to a maximum of 50 m).

2. The subsidence crack rehabilitation work area will be clearly delineated in order to limit disturbance to the minimum area necessary and prevent unnecessary encroachment of disturbance. Disturbance of mature trees will be avoided, where possible. These requirements will be managed through the proponent's Permit to Disturb process.

3. Erosion and sediment controls will be implemented in areas disturbed as part of the subsidence crack rehabilitation program. This may include the installation of minor diversion drains, hay bales and/or silt faces.

4. Grazing pressure will be managed in areas that have been disturbed as part of the subsidence crack rehabilitation program. This may involve the temporary exclusion of stock through the use of fencing, if appropriate.

5. Pest animal and weed control measures will also be implemented for the project (**Section 6.3.2**).

6. A monitoring program will be established for areas that have been disturbed as part of the crack rehabilitation program. The monitoring program is described further in the Subsidence Management Plan (**Section 6.3.4**). The program will initiate crack rehabilitation maintenance work, where necessary, and ensure that the cracks have been successfully rehabilitated and any disturbed vegetation is regenerating. The Subsidence Management Plan will outline monitoring frequency, monitoring parameters and methodology (e.g. photo point monitoring).

7. The ultimate aim of the rehabilitation and monitoring program will be to confirm that any areas disturbed as part of the subsidence crack rehabilitation program are re-established with vegetation communities consistent with the pre-disturbance vegetation communities.

6.2.5 Open Cut Mine Rehabilitation

All areas disturbed by open cut mining activities will be progressively rehabilitated over the life of the project. Areas of woodland will be re-established during rehabilitation, with the primary aim of restoring these areas to the previously occurring woodland communities and creating areas able to support a diverse range of viable flora and fauna populations. In particular, native trees and shrubs will be planted on the plateau areas of overburden emplacements, and native trees and shrubs will be planted on slopes after initial erosion control has been achieved with pasture grasses. At the end of the mine life, areas disturbed by infrastructure will be rehabilitated to woodland, resembling the original vegetation communities present in the study area.

Local provenance native plant species will be utilised in mine rehabilitation where possible and seed will be collected from native vegetation in the study area to ensure genetic diversity is maintained. Topsoil will be stripped ahead of open cut mining and the construction of mine infrastructure and used in rehabilitation to conserve the native seed bank of local ecological communities. This will improve the quality and diversity of native growth in rehabilitation areas and maximise the establishment of a diversity of native species, particularly the understorey species.

Monitoring will be undertaken to track the progress of rehabilitation and identify any remedial works that may be required.

Further detail on rehabilitation is provided in the EIS Rehabilitation Section.

6.3 Management and Monitoring Plans

6.3.1 Biodiversity Management Plan

A Biodiversity Management Plan will be prepared for the project. As indicated in **Section 6.2.3**, it will include measures to conserve and enhance the conservation value of areas of native vegetation that will be retained in the study area (i.e. areas outside of the footprint of the open cut mining area and mine infrastructure area). Measures that will be detailed in the plan include:

- Installation of logs, dead trees, stumps and hollows in strategic locations, in order to enhance habitat values;
- Management of grazing pressure in the study area;
- A Fire Management Plan; and
- Prescriptions for the installation of fauna watering points.

Measures to manage weeds and feral animals will be outlined in the Feral Animal and Weed Management Plan (**Section 6.3.2**).

The Biodiversity Management Plan will also include prescriptions to monitor the ongoing status and health of flora and fauna that is to be retained in the study area, including both vegetation monitoring and threatened species monitoring (**Sections 6.3.1i** and **6.3.1ii**). This monitoring will provide feedback data to determine the level of success of the mitigation measures. Key monitoring indicators and a framework for reporting on the results of the monitoring will be included in the Biodiversity Management Plan.

i. Vegetation Monitoring

The vegetation monitoring program would provide information to quantify any change in biodiversity over time within the study area. Key monitoring indicators for vegetation will include:

- Cover and structure of perennial terrestrial vegetation;
- Composition of perennial terrestrial vegetation; and
- Distribution and abundance of invasive weeds.

Appropriate data management procedures will be implemented to ensure that all data is collected using appropriate techniques and suitably analysed to allow meaningful spatial and temporal comparisons to be made.

ii. Threatened Species Monitoring

Monitoring will also be undertaken on selected species of threatened flora and fauna, in order to confirm the effectiveness of proposed management measures in areas of vegetation

that will be retained. Species that will be the subject of monitoring include the threatened fauna species that were recorded from the study area or assessed as having a high or moderate potential to be present. Key monitoring indicators for threatened species will include:

- Population abundance;
- Species distribution in the study area; and
- Population composition.

Threatened species monitoring will:

- Enable the identification of the impacts of the project on threatened species;
- Identify changes in population numbers over time;
- Determine the success of impact mitigation and conservation measures; and
- Highlight areas for improvement if these measures are found to be inadequate.

Threatened species monitoring will involve conducting targeted threatened species surveys bi-annually in areas of known habitat in order to record the abundance and distribution of selected species. The level of monitoring effort would be determined according to risk level and biology of the particular species in question (e.g. coordinating with breeding or movement times).

6.3.2 Feral Animal and Weed Management Plan

A Feral Animal and Weed Management Plan will be developed in accordance with the provisions of the LP Act and implemented for the study area in order to control feral animals and weeds that are known to occur, and to prevent the introduction and establishment of any new invasive exotic species.

This will include monitoring for the presence and abundance of exotic species recorded from the study area and those with potential to occur. The monitoring program will allow for early recognition of any weed or feral animal that may pose a threat to biodiversity, and will enable the timely implementation of control measures. Key indicators to be used for monitoring weeds and feral animals will include:

- Presence/absence of weeds and feral animals; and
- Distribution and abundance.

The weed monitoring program will be coordinated with the Biodiversity Management Plan described in **Section 6.3.1**.

The Feral Animal and Weed Management Plan will contain details of appropriate management measures that will be implemented if numbers are such that control is required

of any feral animal or weed species. This will include information such as appropriate control strategies, timing, and specifications for follow up works.

6.3.3 Erosion and Sediment Control Plan

An Erosion and Sediment Control Plan will be prepared for the project. It will include mitigation measures that aim to minimise erosion and the release of sediment to receiving waters, and the containment of stormwater. These may include measures such as revegetating soil stockpiles, appropriate timing for soil disturbance activities, and the installation of erosion controls measures.

6.3.4 Subsidence Management Plan

A Subsidence Management Plan will be a requirement of the project's EA to be developed over the life of the project. The Subsidence Management Plan will include:

1. Methods for repairing subsidence cracks and rehabilitation of disturbed vegetation.

2. A description of a monitoring and reporting program to assess the success of natural regeneration of disturbance from subsidence crack rehabilitation. If monitoring indicates that natural regeneration is too slow, then additional measures such as seeding or planting of native species will be undertaken to ensure a return to the original condition of the vegetation.

3. Details of a vegetation monitoring program, which will be undertaken to confirm that subsidence does not give rise to impacts greater than those listed in **Appendices M** and **N** and to identify additional mitigation measures in the event of unanticipated impacts.

4. Survey of the pre-subsidence and post-subsidence condition of ephemeral drainage lines, and prescriptions for management measures to prevent erosion due to subsidence cracking within the bed and banks of an ephemeral drainage line within the limit of measurable subsidence.

5. The installation of remedial drainage works to prevent ponding of water in subsidence troughs.

6. Management measures for subsidence of the northern seasonal wetland and associated farm dam (refer the EIS Aquatic and Stygofauna Ecology Report for further detail).

A copy of the draft Subsidence Management Plan is included as part of the EIS.

6.3.5 Species Management Program

A Species Management Program is required to be developed and implemented for the project in accordance with the requirements of the NC Act (**Section 2.3**). The Species Management Program will outline actions to be taken to minimise impacts on animal breeding places and will be submitted to the EHP for approval prior to the commencement of

construction activities. The program will include prescriptions on the nature and duration of pre-clearance surveys as well as measures to be employed during any clearing activities (e.g. relocation of habitat features such as hollows and logs). Information contained in the Species Management Program will likely be derived from the Biodiversity Management Plan described in **Section 6.3.1**.

CUMBERLAND ECOLOGY

Chapter **7**

Biodiversity Offset Strategy

In order to compensate for the impacts of the project on flora and fauna, biodiversity offsets will be provided for any significant, residual impacts on MNES or MSES. Biodiversity offsets will be developed to address the residual impacts of the project in a strategic and meaningful way that will deliver a real biodiversity outcome, and will ensure that the project does not result in a net loss of biodiversity values.

A summary of the MNES for which offsets are required is presented in **Table 7.1**. The Assessment of Significance undertaken for EPBC Act listed species (**Appendix L**) indicated that the potential exists for the project to have a residual, significant impact on the following species:

- The Squatter Pigeon (southern subspecies) (due to clearing of approximately 1,436 ha of high value habitat for the construction of the open cut mine and mine infrastructure);
- The Black-throated Finch (white-rumped subspecies) (due to clearing of approximately 4,434 ha of high value habitat for the construction of the open cut mine and mine infrastructure); and
- The Koala (due to clearing of approximately 3,246 ha of high value habitat for the construction of the open cut mine and mine infrastructure).

A summary of the MSES in the study area for which offsets are required is presented in **Table 7.2**. The majority of offsets (i.e. offsets for significant, residual impacts on the Squatter Pigeon [southern subspecies], Black-throated Finch [white-rumped subspecies] and Koala) will be covered by offsets provided under the EPBC Act, given that the species are listed under both Commonwealth and state legislation.

The Biodiversity Offset Strategy will include:

- The proposed offset area/s, including the location, property description, ecological values and the proposed mechanism to secure the offset;
- The proposed management strategy for the offset area;
- Monitoring and reporting to be undertaken for the offset;

- A description of the objectives of the offset, in particular relating to any relevant Commonwealth or state conservation objectives or recovery actions for the species; and

- A description of the environmental gains to be achieved with the offset.

The Biodiversity Offset Strategy is included as an appendix to the EIS.

In locating suitable offsets, the Biodiversity Offset Strategy has been guided by the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012) and the QEOP (EHP, 2014c). Direct offsets have been targeted through making use of the Galilee Basin Offset Strategy. In sourcing suitable offsets, larger, connected offsets have been targeted, given that they are more desirable than smaller fragmented areas due their greater chance of becoming self-sustaining and their lower sensitivity to external disturbances and threats.

Table 7.1 Matters of National Environmental Significance in the Study Area Relevant to the Project

MNES	Presence in the Study Area	Potential Project Impact	Offsets
Threatened Fauna Species			
Squatter Pigeon (southern subspecies) [Vulnerable]	This species has been recorded from several locations in the study area (**Figure 14**).	Approximately 1,436 ha of high value habitat for this species is proposed to be cleared to allow for open cut mining and the construction of mine infrastructure. A further 3 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). This clearing has been assessed as potentially giving rise to a significant residual impact on the Squatter Pigeon (southern subspecies) (**Section 5.2.7i**; **Appendix L**). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant, residual impacts.	Biodiversity offsets will be provided to compensate for residual, significant impacts on this species that are predicted to arise due to clearing for open cut mining, mine infrastructure and the construction of remedial drainage works. Offsets are described in the Biodiversity Offset Strategy.
Black-throated Finch (white-rumped subspecies) [Endangered]	This species has been recorded from several locations in the south of the study area (**Figure 14**).	Approximately 4,433.7 ha of high value habitat for this species is proposed to be cleared to allow for open cut mining and the construction of mine infrastructure. A further 9 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). This clearing has been assessed as potentially giving rise to a significant residual impact on the Black-throated Finch (white-rumped subspecies)	Biodiversity offsets will be provided to compensate for residual, significant impacts on this species that are predicted to arise due to clearing for open cut mining, mine infrastructure and the construction of remedial drainage works. Offsets are

MNES	Presence in the Study Area	Potential Project Impact	Offsets
		(**Section 5.2.7ii**; **Appendix L**). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant, residual impacts.	described in the Biodiversity Offset Strategy.
Australian Painted Snipe *[Endangered]	This species has not been recorded from the study area but has potential to occur due to the presence of suitable habitat.	The project would remove approximately 12 ha of potential high value habitat for this species and a further 3 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant residual impacts. This has not been assessed as being a significant residual impact on the Australian Painted Snipe (**Section 5.2.7iii**; **Appendix L**).	No residual, significant impact is predicted to occur to this species and no offsets are proposed.
Koala [Vulnerable]	One individual of this species has been recorded from the southern portion of the study area, (**Figure 14**).	Approximately 3,246 ha of high value habitat for this species is proposed to be cleared to allow for open cut mining and the construction of mine infrastructure. A further 0.4 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). This clearing has been assessed	Biodiversity offsets will be provided to compensate for residual, significant impacts on this species that are predicted to arise due to clearing for open cut mining, mine infrastructure and the

MNES	Presence in the Study Area	Potential Project Impact	Offsets
		as potentially giving rise to a significant residual impact on the Koala (**Section 5.2.7iv**; **Appendix L**). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant, residual impacts.	construction of remedial drainage works. Offsets are described in the Biodiversity Offset Strategy.
Migratory Fauna Species			
Fork-tailed Swift	This species has not been recorded from the study area but has potential to occur due to the presence of suitable habitat.	The project would remove approximately 10,998 ha of potential habitat for this species and a further 12 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant residual impacts. This has not been assessed as being a significant residual impact on the Fork-tailed Swift as the study area is not considered to comprise important habitat for this species and there is no evidence to suggest that the study area supports an ecologically significant proportion of the population of this species and no breeding was observed during field surveys (**Section 5.2.7v**; **Appendix L**).	No residual, significant impact is predicted to occur to this species and no offsets are proposed.

MNES	Presence in the Study Area	Potential Project Impact	Offsets
Cattle Egret	This species has not been recorded from the study area but has potential to occur due to the presence of suitable habitat.	The project would remove approximately 10,998 ha of potential habitat for this species and a further 12 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant residual impacts. This has not been assessed as being a significant residual impact on the Cattle Egret as the study area is not considered to comprise important habitat for this species and there is no evidence to suggest that the study area supports an ecologically significant proportion of the population of this species and no breeding was observed during field surveys (**Section 5.2.7v**; **Appendix L**).	No residual, significant impact is predicted to occur to this species and no offsets are proposed.
Eastern Great Egret +	This species has not been recorded from the study area but has potential to occur due to the presence of suitable habitat.	The project would remove approximately 12 ha of potential habitat for this species and a further 3 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to	No residual, significant impact is predicted to occur to this species and no offsets are proposed.

MNES	Presence in the Study Area	Potential Project Impact	Offsets
		significant residual impacts. This has not been assessed as being a significant residual impact on the Eastern Great Egret as the study area is not considered to comprise important habitat for this species and there is no evidence to suggest that the study area supports an ecologically significant proportion of the population of this species and no breeding was observed during field surveys (**Section 5.2.7v**; **Appendix L**).	
Latham's Snipe	This species has not been recorded from the study area but has potential to occur due to the presence of suitable habitat.	The project would remove approximately 12 ha of potential habitat for this species and a further 3 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant residual impacts. This has not been assessed as being a significant residual impact on the Latham's Snipe as the study area is not considered to comprise important habitat for this species and there is no evidence to suggest that the study area supports an ecologically significant proportion of the population of this species and no breeding was observed during field surveys (**Section 5.2.7v**; **Appendix L**).	No residual, significant impact is predicted to occur to this species and no offsets are proposed.

MNES	Presence in the Study Area	Potential Project Impact	Offsets
Rainbow Bee-eater	This species has been recorded from the study area.	The project would remove approximately 10,998 ha of potential habitat for this species and a further 12 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant residual impacts. This has not been assessed as being a significant residual impact on the Rainbow Bee-eater as the study area is not considered to comprise important habitat for this species and there is no evidence to suggest that the study area supports an ecologically significant proportion of the population of this species and no breeding was observed during field surveys (**Section 5.2.7v**; **Appendix L**).	No residual, significant impact is predicted to occur to this species and no offsets are proposed.
Satin Flycatcher	This species has been recorded from the study area.	The project would remove approximately 10,998 ha of potential habitat for this species and a further 12 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to	No residual, significant impact is predicted to occur to this species and no offsets are proposed.

MNES	Presence in the Study Area	Potential Project Impact	Offsets
		significant residual impacts. This has not been assessed as being a significant residual impact on the Satin Flycatcher as the study area is not considered to comprise important habitat for this species and there is no evidence to suggest that the study area supports an ecologically significant proportion of the population of this species and no breeding was observed during field surveys (**Section 5.2.7v**; **Appendix L**).	

* Species listed as Threatened under the EPBC Act as Painted Snipe (*Rostratula australis*) (sensu lato).

\+ Species listed as a marine species under the EPBC Act as Great Egret (*Ardea alba*).

Table 7.2 Matters of State Environmental Significance in the Study Area Relevant to the Project

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
Regulated Vegetation				
The prescribed regional ecosystems that are endangered regional ecosystems comprise a MSES.	**Endangered regional ecosystem** means a RE declared to be an endangered regional ecosystem under section 22LA of the VM Act.	No Endangered REs listed under the VM Act have been recorded or are likely to occur within the study area (**Section 4.3.3**).	Not applicable.	Not applicable.
The prescribed regional ecosystems that are of concern regional ecosystems comprise a MSES.	**Of concern regional ecosystem** means a RE declared to be an of concern regional ecosystem under section 22LB of the VM Act.	RE 10.10.3: *Eucalyptus drepanophylla* open-woodland on sandstone ranges is an open Eucalyptus woodland, which is listed as Of Concern under the VM Act. Approximately 271 ha of RE 10.10.3 is found on the study area, as shown on **Figure 13**.	Approximately 24 ha of RE 10.10.3 (**Figure 25**) will be cleared for the purposes of open cut mining and the construction of mine infrastructure. No additional areas would be cleared for the construction of remedial drainage works in subsided areas. There will also be disturbance of this community as a result of the subsidence crack rehabilitation program, but this disturbance is small scale and temporary and would not give rise to significant residual impacts.	Offsets are required for the clearing of approximately 24 ha of RE 10.10.3. The offset properties that have been identified in the Biodiversity Offset Strategy contain RE 10.10.3. Offsets for this MSES are described in detail in the Biodiversity Offset Strategy.

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
A prescribed regional ecosystem is a MSES if it is— • a regional ecosystem that intersects with an area shown as a wetland on the vegetation management wetlands map (to the extent of the intersection); or • an area of essential habitat on the essential habitat map for an animal that is endangered wildlife or vulnerable wildlife or a plant that is endangered wildlife or vulnerable wildlife.	The **regulated vegetation management map** is the map certified by the chief executive as the regulated vegetation management map for a part of the State and showing the vegetation category areas for the part under section 20AA of the VM Act.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.
	The **essential habitat map** is a map certified by the chief executive as the essential habitat map for the State and showing, for the State, areas the chief executive reasonably believes are areas of essential habitat for protected wildlife under section 20AC(1) of the VM Act.	No essential habitat as per the EHP's essential habitat map has been mapped within the study area.	Not applicable.	Not applicable.
A prescribed regional ecosystem is a MSES to the extent the ecosystem is located within a defined distance from the defining banks of a relevant watercourse.	**Defined distance** for a regional ecosystem, means a distance identified in the environmental offsets policy as the relevant distance from the defining banks of a relevant watercourse. **Relevant watercourse** means a	Relevant watercourses as per the vegetation management watercourse map have been assessed within the study area and are described in **Section 5.2.3**. Defined distances for the REs on	Approximately 359 ha of vegetation comprising 23 REs as per the vegetation management watercourse map will be cleared as a result of the project.	Offsets are required for the clearing of approximately 14 ha of sparse and 345 ha of very sparse vegetation. As described in the QEOP, offsets must be of the same broad vegetation group as the impacted

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
However, to the extent a prescribed regional ecosystem is located within an urban area, it is not a MSES.	watercourse identified on the vegetation management watercourse map. The **vegetation management watercourse map** is the map certified by the chief executive as the vegetation management watercourse map showing particular watercourses for the State under section 20AB of the VM Act.	the banks of the watercourses have been applied and are also described in **Section 5.2.3.**		RE, within the same bioregion and associated with a watercourse. The offsets that will be provided for other MSES (i.e. the Squatter Pigeon [southern subspecies], Black-throated Finch [white-rumped subspecies] and the Koala) will also address any significant, residual impacts on this MSES, given that the offsets involve securing and conserving large areas of woodland vegetation. Offsets for this MSES are described in detail in the Biodiversity Offset Strategy.
Connectivity Areas				
This section applies to a prescribed regional ecosystem: • to the extent the ecosystem contains remnant vegetation; and • if the ecosystem contains an area of	Remnant vegetation means vegetation forming the predominant canopy of the vegetation: • covering more than 50% of the undisturbed predominant canopy; and • averaging more than	The entire study area has been mapped as remnant vegetation. BPA mapping for the study area indicates that the entire study area is classified as State Biodiversity Significance, and that the majority of the study area, with the exception of the north-east and north-west	As discussed in **Section 5.2.6iv**, the project will not have a significant residual impact on connectivity areas given the management of remaining vegetation on-site and the large gap (which contains remnant vegetation) that will remain between the	Not applicable.

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
land that is required for ecosystem functioning (a connectivity area). The prescribed regional ecosystem is a MSES if the administering agency is satisfied, having had regard to criteria in the environmental offsets policy about connectivity areas, that: • the connectivity area is of sufficient size or configured in a way that maintains ecosystem functioning; and • the prescribed regional ecosystem will remain despite a threatening process within the meaning of the *Nature Conservation Act 1992.* However, to the extent a prescribed regional ecosystem	70% of the vegetation's undisturbed height; and • composed of species characteristic of the vegetation's undisturbed predominant canopy.	corners, is considered to be within a State Biodiversity Corridor.	CCM&RP and the project (**Figure 26**). In addition, EHP's LCF Tool determined that the project would not result in a significant residual impact on local or regional connectivity and therefore offsets for connectivity are not required for the project.	

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
is located within an urban area, it is not a MSES.				
Wetlands and watercourses				
Each of the following matters is a MSES— • a wetland— ○ in a wetland protection area; or • of high ecological significance shown on the Map of referable wetlands;	**Wetland** means an area shown as a wetland on the Map of referable wetlands. **Wetland protection area** means an area shown as a wetland protection area on the Map of referable wetlands. **Map of referable wetlands** means the 'Map of referable wetlands', a document approved by the chief executive on 4 November 2011 and published by the department, as amended from time to time by the chief executive under section 144D of the *Environmental Protection Regulation 2008*.	This MSES is addressed in the EIS Aquatic and Stygofauna Ecology Report.	This MSES is addressed in the EIS Aquatic and Stygofauna Ecology Report.	This MSES is addressed in the EIS Aquatic and Stygofauna Ecology Report.
• a wetland or watercourse in high ecological value waters.	**Wetland** means an area shown as a wetland on the Map of referable wetlands. **Watercourse** is defined in schedule 12, part 1, section 8 of the *Environmental Protection*	This MSES is addressed in the EIS Aquatic and Stygofauna Ecology Report.	This MSES is addressed in the EIS Aquatic and Stygofauna Ecology Report.	This MSES is addressed in the EIS Aquatic and Stygofauna Ecology Report.

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
	Regulation 2008 and is: • a river, creek or stream in which water flows permanently or intermittently— o in a natural channel, whether artificially improved or not; or o in an artificial channel that has changed the course of the watercourse. • A ***watercourse*** includes the bed and banks and any other element of a river, creek or stream confining or containing water. **High ecological value waters** means waters in which the biological integrity of the water is effectively unmodified or highly			

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
	valued under schedule 2 of the *Environmental Protection (Water) Policy 2009*.			
High preservation areas of wild river areas				
A part of a wild river area described as a high preservation area in the wild river declaration for the area is a matter of State environmental significance. However, to the extent a wild river area described as a high preservation area is in an urban area, it is not a matter of State environmental significance.	**Wild river area**s see the *Wild Rivers Act 2005*. **Wild river declaration** see the *Wild Rivers Act 2005.*	The study area does not contain any high preservation areas in a wild river declaration.	Not applicable.	Not applicable.
Protected Wildlife Habitat				
An area that is shown as a high risk area on the flora survey trigger map and that contains plants that are endangered wildlife or vulnerable wildlife is a MSES.	**Flora survey trigger map** means the map held by EHP under section 247 of the *Nature Conservation (Wildlife Management) Regulation 2006*.	The flora survey trigger map has not identified any high risk areas that contain plants that are endangered wildlife or vulnerable wildlife within the study area.	Not applicable.	Not applicable.
An area that is not shown as a high risk area on the flora survey trigger map, to the	**Flora survey trigger map** means the map held by EHP under section 247 of the *Nature*	No threatened flora species listed as Endangered or Vulnerable under the NC Act	Not applicable.	Not applicable.

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
extent that the area contains plants that are endangered wildlife or vulnerable wildlife is a MSES.	*Conservation (Wildlife Management) Regulation 2006*.	have been recorded or are likely to occur within the study area (**Section 4.5.2**).		
A non-juvenile koala habitat tree located in an area shown as bushland habitat, high value rehabilitation habitat or medium value rehabilitation habitat on the map called 'Map of Assessable Development Area Koala Habitat Values' that applies under the South East Queensland Koala Conservation State Planning Regulatory Provisions is a MSES.	**Koala habitat tree** means a tree of any of the following genera— • *Angophora;* • *Corymbia;* • *Eucalyptus;* • *Lophostemon;* • *Melaleuca*. **Non-juvenile koala habitat tree** means a koala habitat tree that— • is more than 4 m high; or • has a trunk with a circumference of more than 31.5 cm at 1.3 m above the ground. **South East Queensland Koala Conservation State Planning Regulatory Provisions** means the document called the '*South East Queensland Koala Conservation State Planning Regulatory Provisions'*, dated May 2010 and published on the website of the department in	No areas within the study area have been mapped as bushland habitat, high value rehabilitation habitat or medium value rehabilitation habitat on the map called 'Map of Assessable Development Area Koala Habitat Values' that applies under the South East Queensland Koala Conservation State Planning Regulatory Provisions.	Not applicable.	Not applicable.

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
	which the *Sustainable Planning Act 2009* is administered.			
A habitat for an animal that is endangered wildlife or vulnerable wildlife or a special least concern animal is a MSES.	Examples of habitat include an area of land used by an animal for foraging, roosting, nesting or breeding **Special least concern animal** means the following animals that are least concern wildlife under the NC Act: • a koala (*Phascolarctos cinereus*); • an echidna (*Tachyglossus aculeatus*); • a platypus (*Ornithorhynchus anatinus*).	Four fauna species listed as threatened or Special Least Concern under the NC Act have been recorded within the study area, namely: • Squatter Pigeon (southern subspecies) (*Geophaps scripta scripta*) (listed as Vulnerable under the NC Act); • Black-throated Finch (white-rumped subspecies) (*Poephila cincta cincta*) (listed as Endangered under the NC Act); • Koala (*Phascolarctos cinereus*) (listed as Special Least Concern under the NC Act); and • Short-beaked Echidna (Tachyglossus aculeatus) (listed as	Please refer to **Table 7.1** for a discussion of the Squatter Pigeon (southern subspecies); Black-throated Finch (white-rumped subspecies); Australian Painted Snipe (*Rostratula australis*) and Koala, given that these species are also MNES and are addressed in this table. Signficant residual impacts are predicted for the Squatter Pigeon (southern subspecies); Black-throated Finch (white-rumped subspecies) and Koala. As detailed in Section 5.2.8i, the project wiil not significantly impact the Short-beaked Echidna.	Please refer to **Table 7.1** for offset requirement for the Squatter Pigeon (southern subspecies); Black-throated Finch (white-rumped subspecies) and Koala. Offsets proposed for these species are described in detail in the Biodiversity Offset Strategy.

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
		Special Least Concern under the NC Act).		
Protected Areas				
A protected area is a MSES.	A coordinated conservation area under the *Nature Conservation Act 1992* is excluded by the *Environmental Offsets Act 2014*, definition protected area.	No protected areas are within the study area.	Not applicable.	Not applicable.
Highly protected zones of State marine parks				
A highly protected area of a relevant Queensland marine park is a MSES.	**Highly protected area** means: • a zone classified, under the *Marine Parks Act 2004*, as a conservation park zone, marine national park zone or preservation zone; or • another area prescribed under a regulation or zoning plan, under the *Marine Parks Act 2004*, as a highly protected area. **Relevant Queensland marine park** means any of the following marine parks declared under the *Marine Parks Act 2004:*	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
	• the Great Barrier Reef Coast Marine Park; • the Moreton Bay Marine Park; • the Great Sandy Marine Park. **Zone**, for a marine park, see the *Marine Parks Act 2004*, schedule.			
Fish habitat areas				
An area declared under the *Fisheries Act 1994* to be a fish habitat area is a MSES.	The *Fisheries Act 1994* details areas to be declared as a fish habitat area.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.
Waterway providing for fish passage				
Any part of a waterway providing for passage of fish and not located within an urban area is a matter of State environmental significance only if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway.	**Fish** means fish regulated under the *Fisheries Act 1994*. **Passage**, for fish, means the natural movement patterns of fish species required to maintain the biological integrity of the species. **Waterway** includes a river, creek, stream, watercourse or inlet of the sea. **Waterway barrier works** means a dam, weir or other barrier across a waterway.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.

Matters of State Environmental Significance	Details	Presence in Study Area	Potential Project Impact	Offsets
Marine plants				
A marine plant within the meaning of the *Fisheries Act 1994* is a MSES. However, a marine plant is not a MSES if the plant is in an urban area.	Section 8 of the *Fisheries Act 1994* defines a marine plant as: • plant (a "tidal plant") that usually grows on, or adjacent to, tidal land, whether it is living, dead, standing or fallen; • material of a tidal plant, or other plant material on tidal land; • a plant, or material of a plant, prescribed under a regulation or management plan to be a marine plant.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.	This MSES is addressed in the EIS Aquatic Ecology and Stygofauna Report.
Legally secured offset areas				
A legally secured offset area is a MSES.	A **legally secured offset area** is an area of land the subject of a covenant under the *Land Act 1994.*	There are no offset areas present on the study area.	Not applicable.	Not applicable.

* Species listed as Threatened under the EPBC Act as Painted Snipe (*Rostratula australis*) (sensu lato).

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References

AMEC (2005). *Mackenzie Gas Project: Effects of Noise on Wildlife*. AMEC Americas Limited.

Bennett, A. F. (1990). *Habitat Corridors: Their role in wildlife management and conservation*. Department of Conservation and Environment, Melbourne, Australia.

Black-throated Finch Recovery Team (2007). *National recovery plan for the black-throated finch southern subspecies Poephila cincta cincta . Report to the Department of the Environment and Water Resources, Canberra*. Department of Environment and Climate Change (NSW) and Queensland Parks and Wildlife Service, Brisbane., Hurstville and Brisbane.

BOM (2014a). "Atlas of Groundwater Dependent Ecosystems." from http://www.bom.gov.au/water/groundwater/gde/map.shtml.

BOM (2014b). "Climate Statistics for Clermont Airport (035124) and Carmichael (036122) Weather Stations." Retrieved September, 2014, from http://www.bom.gov.au/climate/data.

Brooker, M. I. H. and Kleinig, D. A. (2004). *Field Guide to eucalypts – Vol. 3 northern Australia, 2nd edition*. Bloomings Books, Melbourne.

CHAH (2015). "Specimen search results - Nesaea robertsii." Retrieved March 2015, from http://avh.ala.org.au/occurrences/search?taxa=Nesaea+robertsii.

Churchill, S. (2009). *Australian Bats*. Allen & Unwin, Crows Nest.

CMS (2015). "Convention on the Conservation of Migratory Species of Wild Animals." Retrieved 2015, from http://www.cms.int/.

DEH (2005). *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs*. Department of Environment and Heritage, Canberra.

DERM (2010a). *Burdekin Natural Resource Management Region Back on Track Actions for Biodiversity*. Department of Environment and Resource Management, Brisbane.

DERM (2010b). *Management Program for protected plants in Queensland 2011 - 2015*. Department of Environment and Resource Management.

DERM (2012). *National recovery plan for the red goshawk Erythrotriorchis radiatus. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra*. Queensland Department of Environment and Resource Management, Brisbane.

DEWHA (2008). *Desert Uplands Biogregion*. Department of Environment, Water, Heritage and the Arts, Canberra.

DEWHA (2009). *Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta)*. Department of the Environment, Water, Heritage and the Arts, Canberra.

DEWHA (2010a). *Survey guidelines for Australia's threatened birds*. Commonwealth Department of Environment, Water, Heritage and the Arts, Canberra.

DEWHA (2010b). *Survey guidelines for Australia's threatened frogs*. Commonwealth Department of Environment, Heritage, Water and the Arts, Canberra, ACT.

DNRM (2001). *NRM facts. QNRM01117*. Department of Natural Resources and Mines.

DotE (2013). *Matters of National Environmental Significance. Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment, Canberra.

DotE (2014a). *Actitis hypoleucos in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014b). *Apus pacificus in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014c). *Ardea ibis in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014d). *Ardea modesta in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014e). "Bilateral migratory bird agreements." Retrieved 19 January 2015, from http://laptop.deh.gov.au/biodiversity/migratory/waterbirds/bilateral.html.

DotE (2014f). *Calidris acuminata in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014g). *Denisonia maculata in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014h). *Egernia rugosa in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014i). *EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)*. Department of the Environment, Canberra.

DotE (2014j). *Erythrotriorchis radiatus in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014k). *Gallinago hardwickii in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014l). *Geophaps scripta scripta in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014m). *Haliaeetus leucogaster in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014n). *Hydroprogne caspia in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014o). *Livistona lanuginosa in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014p). "Macrotis lagotis in Species Profile and Threats Database." Retrieved 25 August, 2014, from http://www.environment.gov.au/sprat.

DotE (2014q). *Merops ornatus in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014r). *Myiagra cyanoleuca in Species Profile and Threats Database*. Comomnwealth Department of the Environment, Canberra.

DotE (2014s). *Neochmia ruficauda ruficauda in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014t). *Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014u). *Plegadis falcinellus in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014v). *Poephila cincta cincta in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014w). *Rostratula australis in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2014x). *Tringa nebularia in Species Profile and Threats Database*. Department of the Environment, Canberra.

DotE (2014y). *Tringa stagnatilis in Species Profile and Threats Database*. Commonwealth Department of the Environment, Canberra.

DotE (2015). "EPBC Protected Matters Search Tool." Retrieved 2015, from http://www.environment.gov.au/epbc/protected-matters-search-tool.

DSITIA (2012). "Regional Ecosystem Technical Descriptions of the Desert Uplands". In. (Eds. E. J. Thompson). Queensland Herbarium, Department of Science, Information Technology, Innovation and the Arts, Brisbane.

Eco Logical Australia (2014). *Carmichael Coal Mine Ecological Equivalence Assessment Stage 2*. Eco Logical Australia Pty Ltd, Fortitude Valley.

EHP (2013). *Galilee Basin Offsets Strategy*. Department of Environment and Heritage Protection, Brisbane.

EHP (2014a). "Back on Track Actions for Biodiversity documents." Retrieved 2014, from https://www.ehp.qld.gov.au/wildlife/prioritisation-framework/bot-biodiversity-documents.html.

EHP (2014b). "Myriophyllum artesium, WetlandInfo." Retrieved 19 November 2014, from http://wetlandinfo.ehp.qld.gov.au/wetlands/ecology/components/species/?myriophyllum-artesium.

EHP (2014c). *Queensland Environmental Offsets Policy (Version 1.1)*. State of Queensland.

EHP (2014d). *Queensland Environmental Offsets Policy Significant Residual Impact Guideline*. Queensland Government, Brisbane.

EHP (2014e). "Sporobolus pamelae, WetlandInfo." Retrieved 19 November 2014, from http://wetlandinfo.ehp.qld.gov.au/wetlands/ecology/components/species/?sporobolus-pamelae.

EHP (2015). "Wildlife Online Database." Retrieved March, 2015, from https://www.qld.gov.au/environment/plants-animals/species-list/.

Ellis, W. A. H., Melzer, A., Carrick, F. N. and Hasegawa, M. (2002). "Tree use, diet and home range of the koala (*Phascolarctos cinereus*) at Blair Athol, central Queensland." *Wildlife Research* **29**: 303-311.

Eyre, T. J., Ferguson, D. J., Hourigan, C. L., Smith, G. C., Mathieson, M. T., Kelly, A. L., Venz, M. F. and Hogan, L. D. (2012). *Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland*. I. T. Department of Science, Innovation and the Arts, Queensland Government, Brisbane.

Eyre, T. J., Ferguson, D. J., Hourigan, C. L., Smith, G. C., Mathieson, M. T., Kelly, A. L., Venz, M. F., Hogan, L. D. and Rowland, J. (2014). *Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland*. Department of Science, Information Technology, Innovation and the Arts, Queensland Government, Brisbane.

Eyre, T. J., Wang, J., Venz, M. F., Chilcott, C. and Whish, G. (2009). "Buffel grass in Queensland's semi-arid woodlands: response to local and landscape scale variables, and relationship with grass, forb and reptile species." *The Rangeland Journal* **31**: 293-305.

Fahrig, L. (2003). "Effects of habitat fragmentation on biodiversity." *Annual Review of Ecology Evolution and Systematics* **34**: 487–515.

Farmer, A. M. (1993). "The Effect of Dust on Vegetation - A Review." *Environmental Pollution* **79**: 63-75.

Fensham, R. and Fairfax, R. (2007). *Talking Fire: Burning for pastoral management in the Desert Uplands*. Watson Ferguson & Company, Salisbury.

Franks, D., Brereton, D. and Moran, C. (2008). *Managing the cumulative impacts of multiple mines on regional communities and environments in Australia*. Paper Submitted to the International Association for Impact Assessment, Assessing and Managing Cumulative Environmental Effects Special Topic Meeting, Calgary, Canada, 6-9 November, 2008.

Garnett, S. and Crowley, G. M. (2000). *The Action Plan for Australian Birds 2000*. Environment Australia.

GHD (2012a). *Carmichael Coal Mine Project. Moray Downs Black-throated Finch Surveys*. GHD Pty Ltd.

GHD (2012b). *Report for Carmichael Coal Mine and Rail Project. Matters of National Environmental Significance 25215-D-RP-0029*. GHD Pty Ltd.

GHD (2012c). *Report on Carmichael Coal Mine and Rail Project Mine. Technical Report: Terrestrial Ecology Report 23244-D-RP-0024*. GHD Pty Ltd.

GHD (2013a). *Carmichael Coal Mine and Rail Project SEIS. Report for Matters of National Environmental Significance*. GHD Pty Ltd.

GHD (2013b). *Carmichael Coal Mine and Rail Project SEIS. Report for Updated Mine Ecology*. GHD Pty Ltd.

GHD (2013c). *Carmichael Coal Mine and Rail SEIS. Report for Black-throated Finch On-site Monitoring Survey 1*. GHD Pty Ltd.

GHD (2014a). *Carmichael Coal Mine and Rail Project. Black-throated Finch Management Plan*. GHD Pty Ltd.

GHD (2014b). *Carmichael Coal Mine and Rail SEIS. Report for Black-throated finch On-site Monitoring Survey 2*. GHD Pty Ltd.

Lindenmayer, D. B. and Fischer, J. (2006). *Habitat fragmentation and landscape change: An Ecological and Conservation Synthesis*. Island Press, Washington D.C.

Longcore, T. and Rich, C. (2004). "Ecological Light Pollution." *Frontiers in Ecology and Environment* **2**(4): 191-198.

Longcore, T. and Rich, C. (2010). *Light Pollution and Ecosystems*, ActionBioscience.org original article.

Maslin, B. R. (2001). *WATTLE: Acacias of Australia CD-ROM, Version 1.0*. Australian Biological Resources Study, Canberra, and Department of Conservation and Land Management Perth.

Melzer, A., Ellis, A. R., FitzGibbon, S. and Manno, G. (2014). "The habitat and diet of koalas (Phascolarctos cinereus) in Queensland." *Australian Mammalogy* **36**(2): 189-199.

Menkhorst, P. and Knight, F. (2004). *A field guide to the mammals of Australia*. Oxford University Press, South Melbourne, Victoria.

Neldner, V. J., Wilson, B. A., Thompson, E. J. and Dillewaard, H. A. (2005). *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 3.1. Updated September 2005.* Queensland Herbarium, Environmental Protection Agency, Brisbane.

Neldner, V. J., Wilson, B. A., Thompson, E. J. and Dillewaard, H. A. (2012). *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. Version 3.2. Updated August 2012. Queensland Herbarium, Queensland Department of Science, Information Technology, Innovation and the Arts, Brisbane.

NSW NPWS (1999). *Threatened Species Information: Squatter Pigeon*. New South Wales National Parks and Wildlife Service, Hurstville.

OEH (2014). *Koala habitat and feed trees*. NSW Office of Environment and Heritage, Hurstville.

Pavey, C. (2006). *National Recovery Plan for the Greater Bilby Macrotis lagotis,*. Department of Natural Resources Environment and the Arts, Northern Territory.

Pettit, N. E. and Dowe, J. L. (2004). "Distribution and population structure of the vulnerable riparian palm Livistona lanuginosa A.N.Rodd (Arecaceae) in the Burdekin River catchment, north Queensland. Pacific." *Conservation Biology* **9**(3): 207-214.

Pizzey, G. and Knight, F. (2003). *The Field Guide to the Birds of Australia*. HarperCollins Publishers Pty Ltd, Australia.

Primack, R. B. (1993). *Essentials of Conservation Biology*. Sinauer Associates Inc, Sunderland.

Queensland Herbarium (2014). *Regional Ecosystem Database (REDD) Version 8.1*. Queensland Department of Science, Information Technology, Innovation and the Arts, Brisbane.

Queensland Herbarium (2015). *Herbarium Records Database (HERBRECS).* Department of Environment and Heritage, Brisbane.

Queensland Museum (2015). "Zoology Data Search." Retrieved March, 2015, from http://www.qm.qld.gov.au/Research/Biodiversity/Zoology+Data+Search#.VPjcYSwavhk.

Reid, J. R. W. (1999). *Threatened and declining birds in the New South Wales sheep-wheat belt: I Diagnosis, characteristics and management*. CSIRO Wildlife and Ecology, Canberra.

Richardson, S., Irvine, E., Froend, R., Boon, P., Barber, S. and Bonneville, B. (2011). *Australian groundwater-dependent ecosystems toolbox part 1: assessment framework*. National Water Commission,, Canberra.

Saleh, T. (2007). "Effects of Artificial Lighting on Wildlife." *The Road-RIPorter (Summer Solstice Issue)* **12**(2).

Sattler, P. S. and Williams, R. D., Eds. (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

SEWPaC (2011a). *Survey guidelines for Australia's threatened mammals*. Commonwealth Department of Sustainability, Environment, Water, Population and Communities, Canberra.

SEWPaC (2011b). *Survey guidelines for Australia's threatened reptiles*. Commonwealth Department of Sustainability, Environment, Water, Population and Communities, Canberra.

SEWPaC (2012). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy. October 2012*. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Sharp, D. and Simon, B. K. (2002). *AusGrass; Grasses of Australia, CD-ROM, Version 1.0*. Australian Biological Resources Study, Canberra, and Environmental Protection Agency Queensland.

Taylor, B. D. and Goldingay, R. L. (2010). "Roads and wildlife: impacts, mitigation and implications for wildlife management in Australia." *Wildlife Research* **37**(4): 320-331.

Threatened Species Scientific Committee (2008a). *Approved Conservation Advice for Lawrencia buchananensis*. Commonwealth Department of the Environment, Water, Heritage and the Arts, Canberra.

Threatened Species Scientific Committee (2008b). *Approved Conservation Advice for Livistona lanuginosa (Waxy Cabbage Palm)*. Commonwealth Department of Environment, Water, Heritage and the Arts, Canberra.

Tyler, M. J. and Knight, F. (2009). *Field Guide to the Frogs of Australia*. CSIRO Publishing, Collingwood, Victoria, Australia.

Wildcare Australia (2013). "Koalas." Retrieved 2013, from http://wildcare.org.au/species-information/koalas/.

Wildlife Preservation Society of Queensland (2013). "Short-beaked Echidna." Retrieved 17 December 2014, from http://www.wildlife.org.au/wildlife/speciesprofile/mammals/short_beaked_echidna.html.

Wilson, S. (2005). *A field guide to reptiles of Queensland* Reed New Holland Publishing, Frenchs Forest.

Yahner, R. H. (1988). "Changes in wildlife communities near edges." *Conservation Biology* **2**: 333-339.

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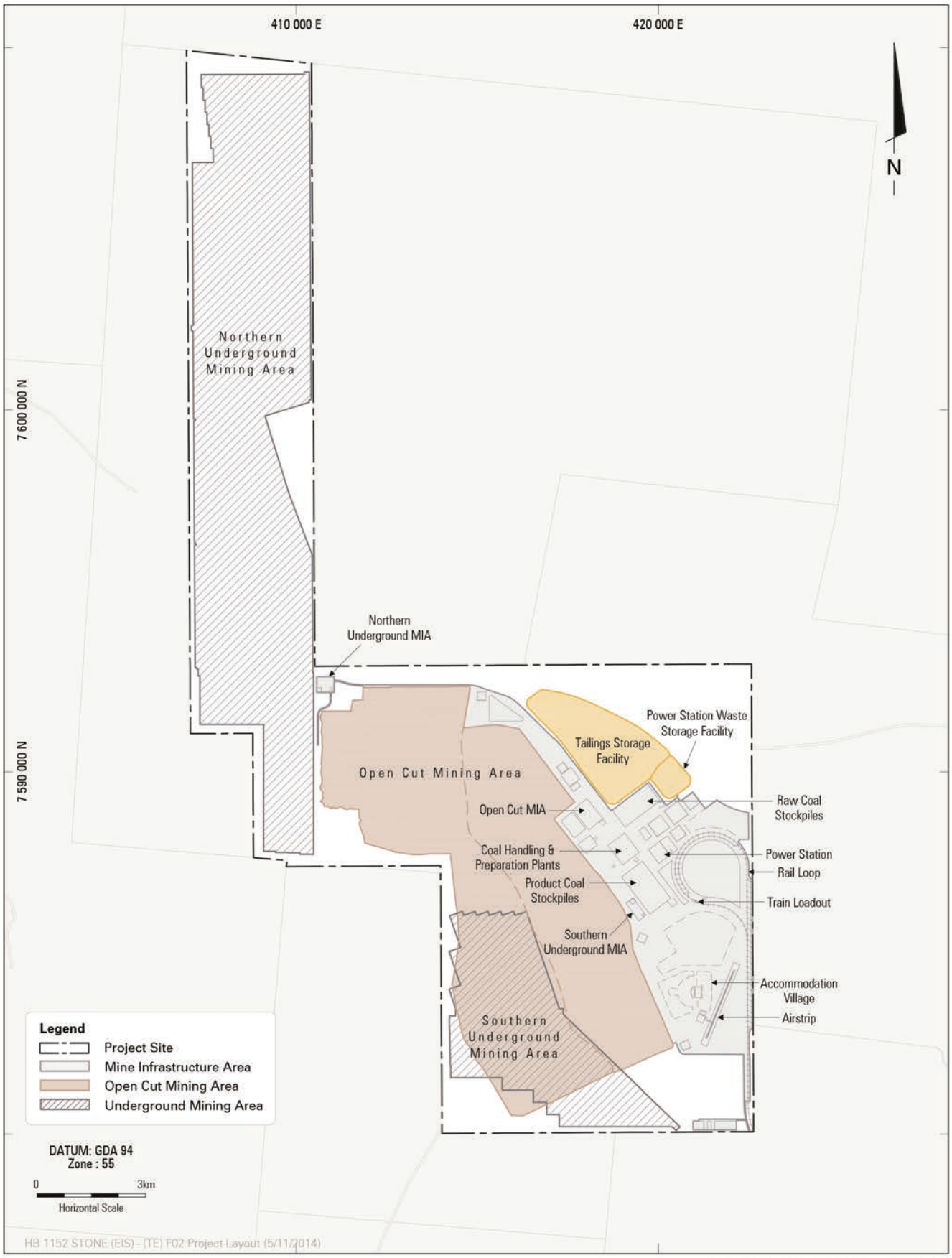


PROJECT CHINA STONE

MACMINES AUSTASIA | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Project Location

FIGURE 1



PROJECT CHINA STONE

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Project Layout

FIGURE 2

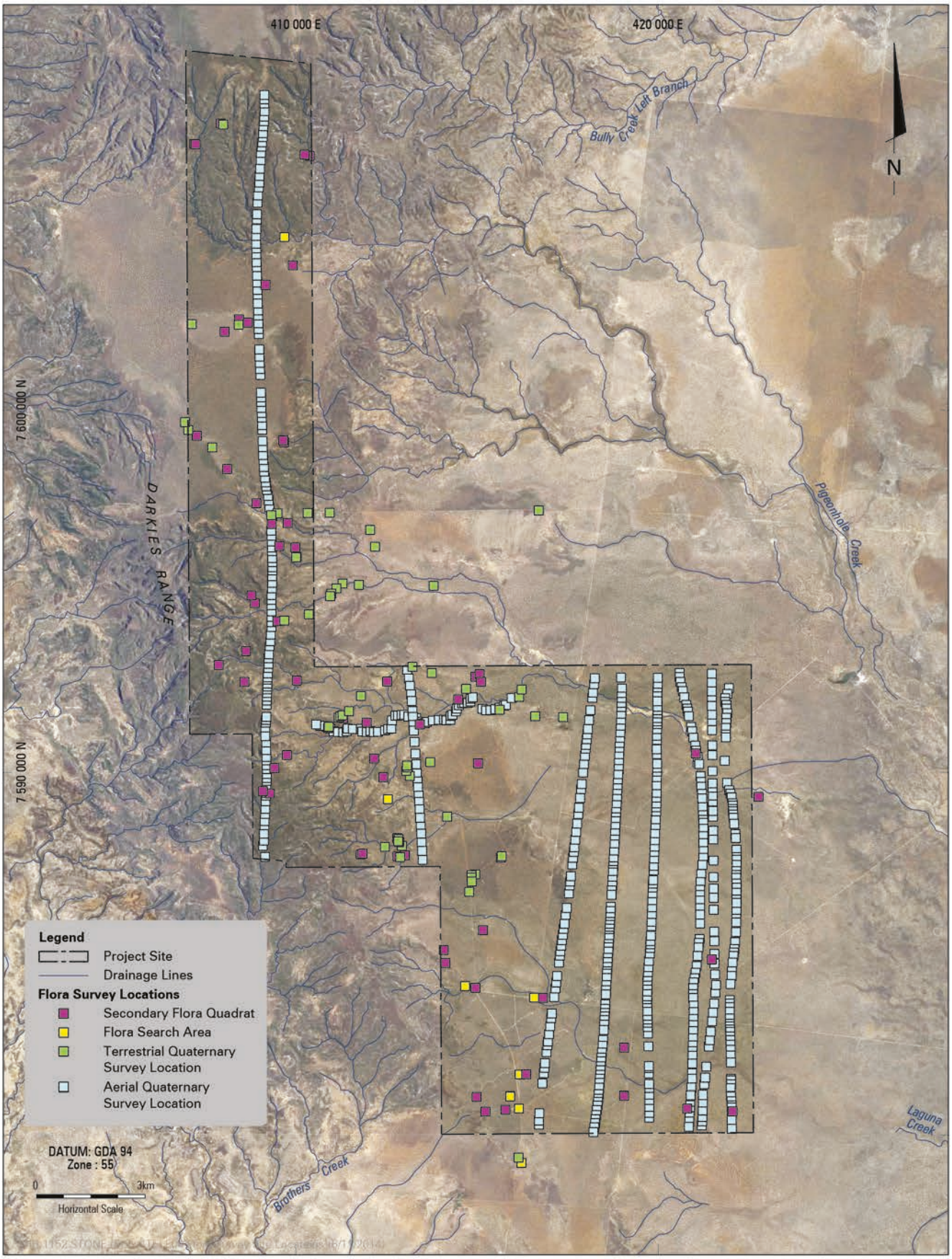


PROJECT CHINA STONE

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Bioregion Setting

FIGURE 3



PROJECT CHINA STONE

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Flora Survey Sites

FIGURE 4

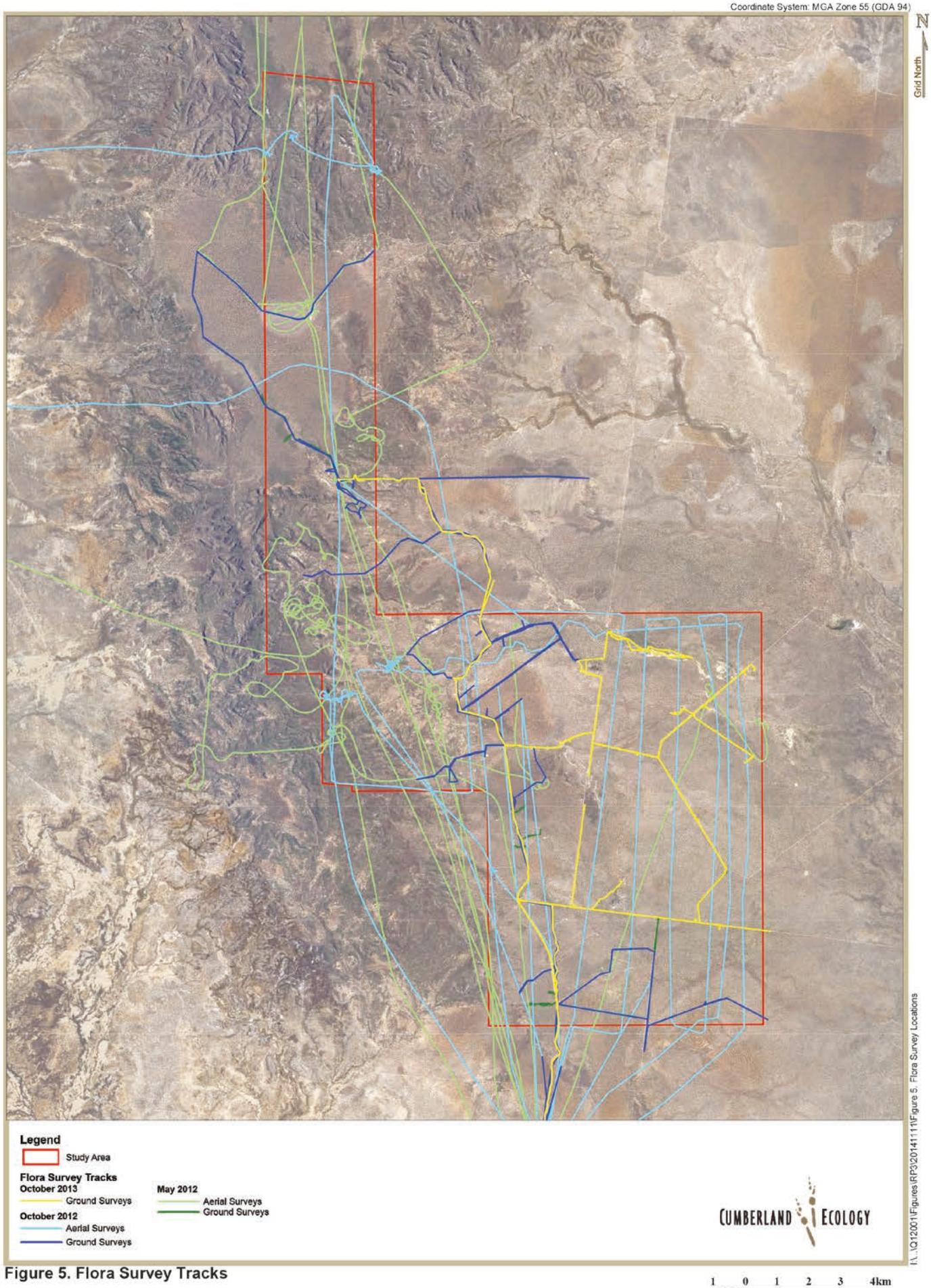


Figure 5. Flora Survey Tracks

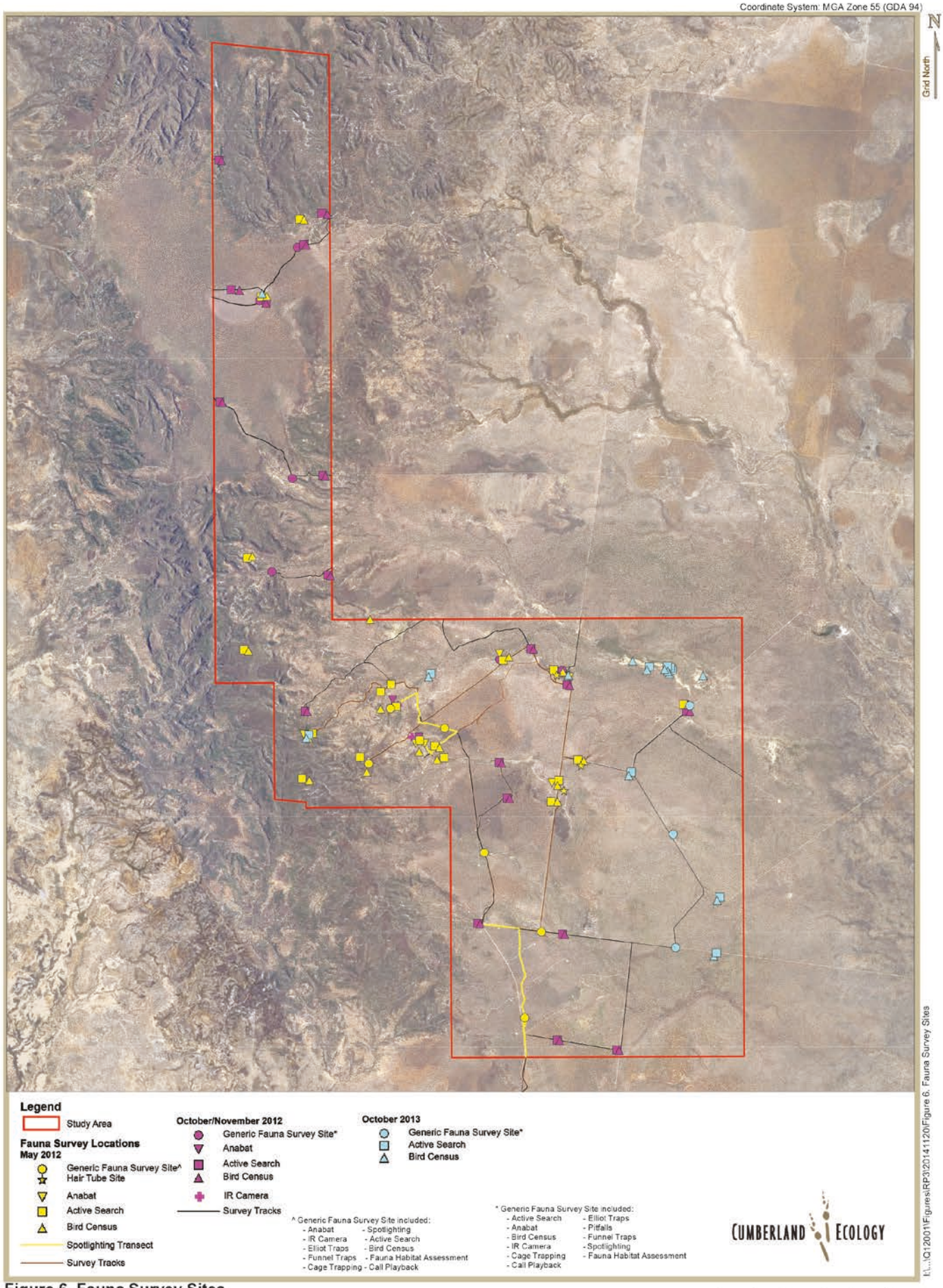
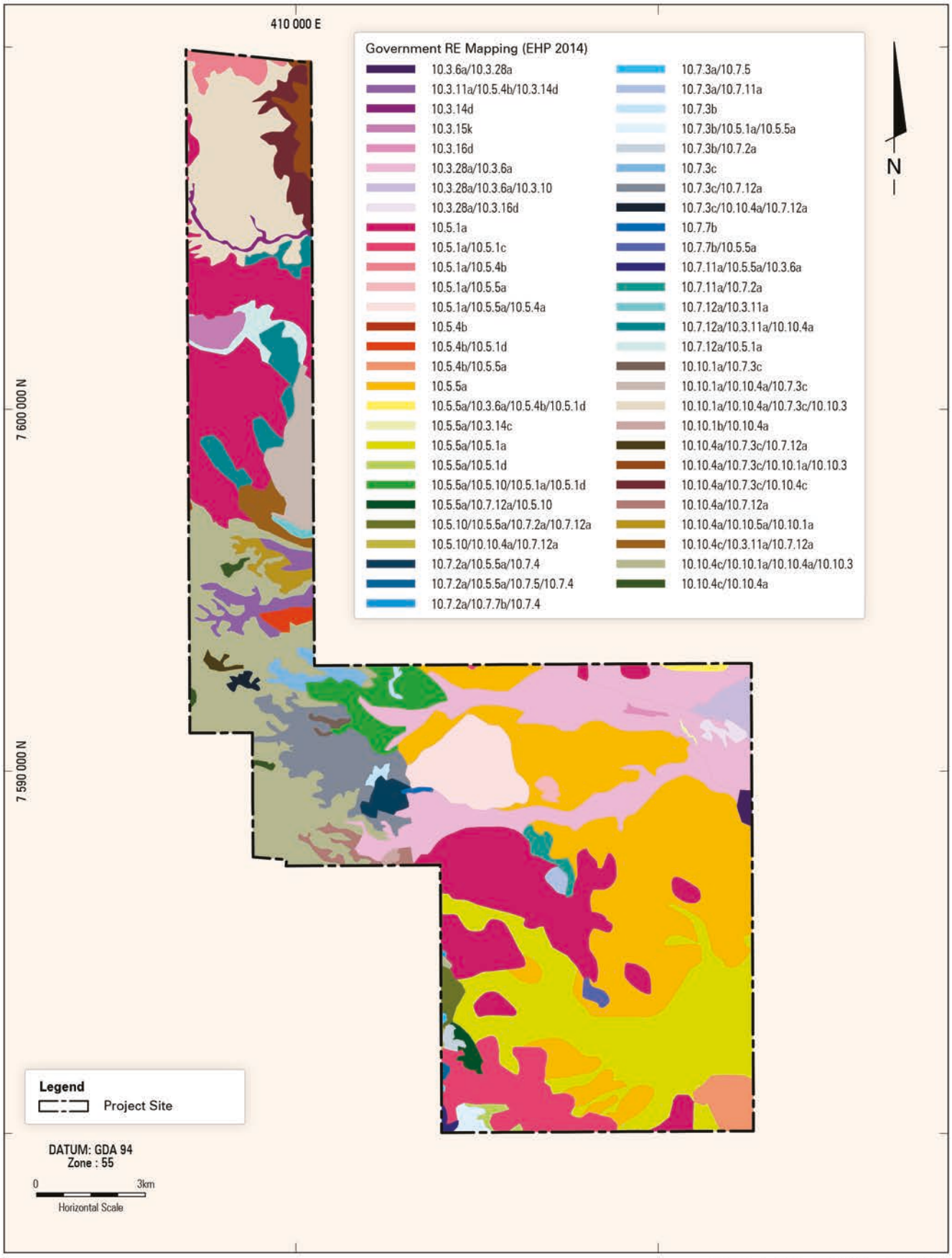


Figure 6. Fauna Survey Sites

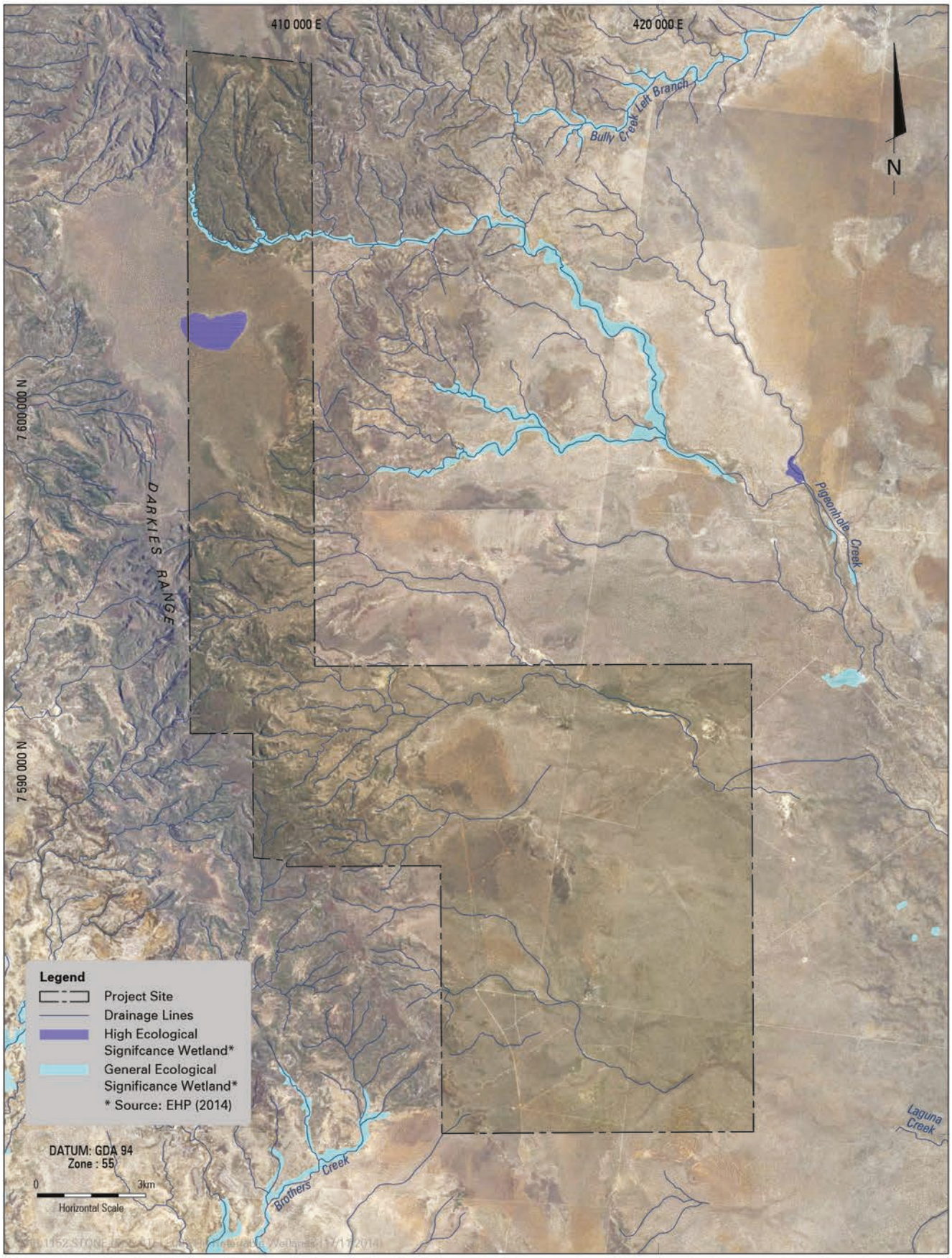


PROJECT CHINA STONE

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Queensland Government Regional Ecosystem Mapping of the Study Area

FIGURE 7



PROJECT CHINA STONE

MACMINES AUSTASIA | Hansen Bailey ENVIRONMENTAL CONSULTANTS

EHP Map of Referrable Wetlands

FIGURE 8

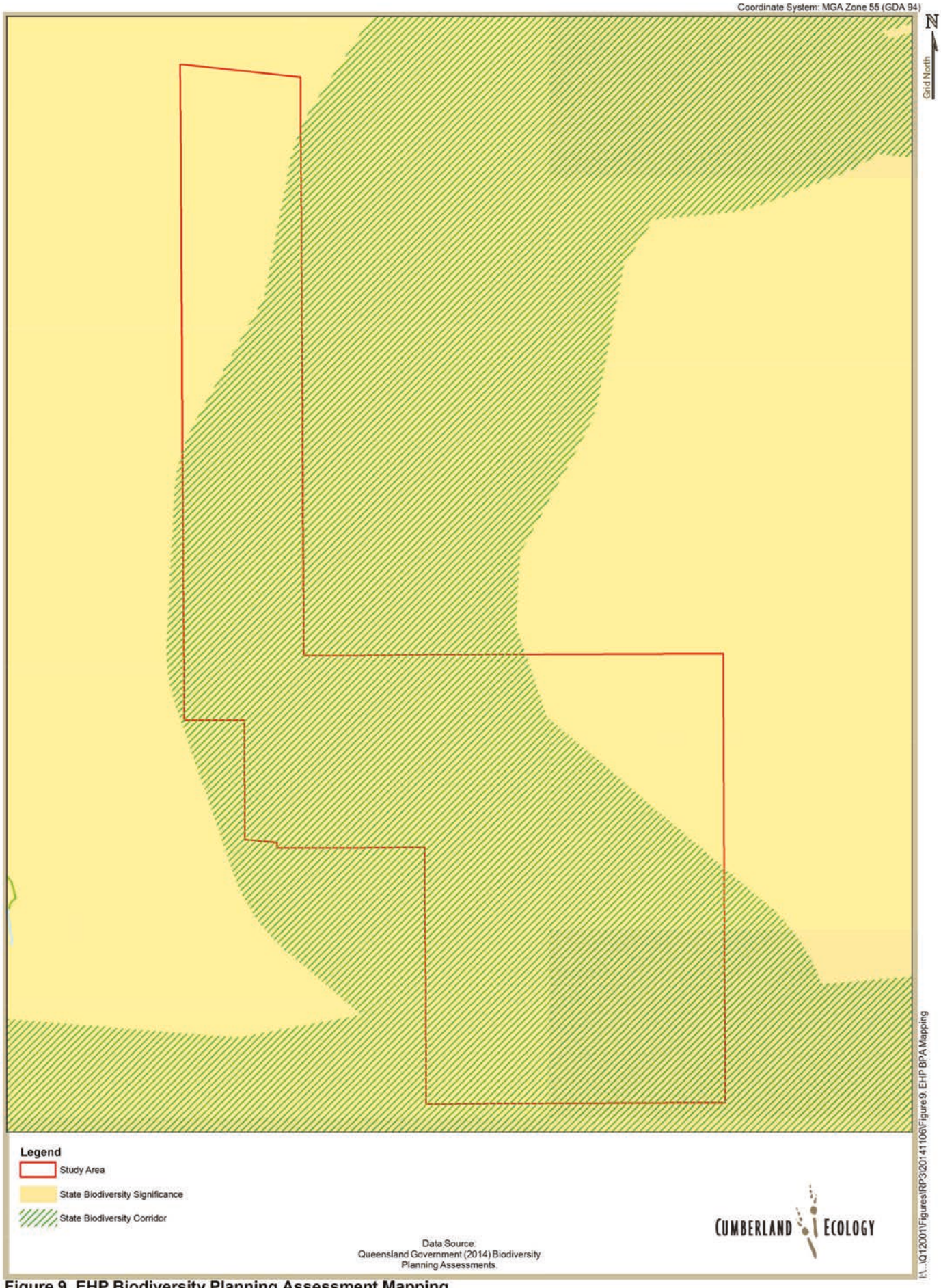
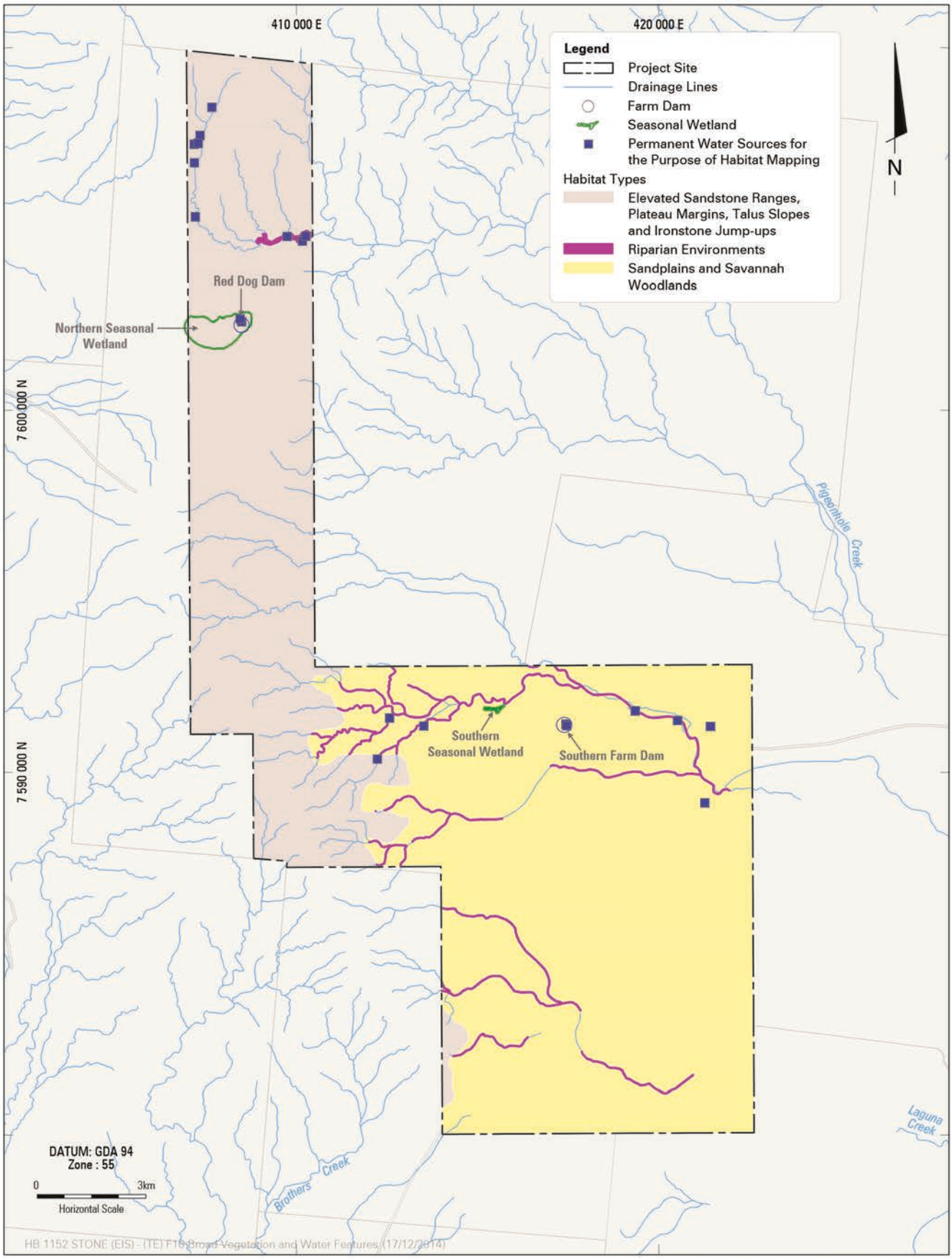


Figure 9. EHP Biodiversity Planning Assessment Mapping of the Study Area

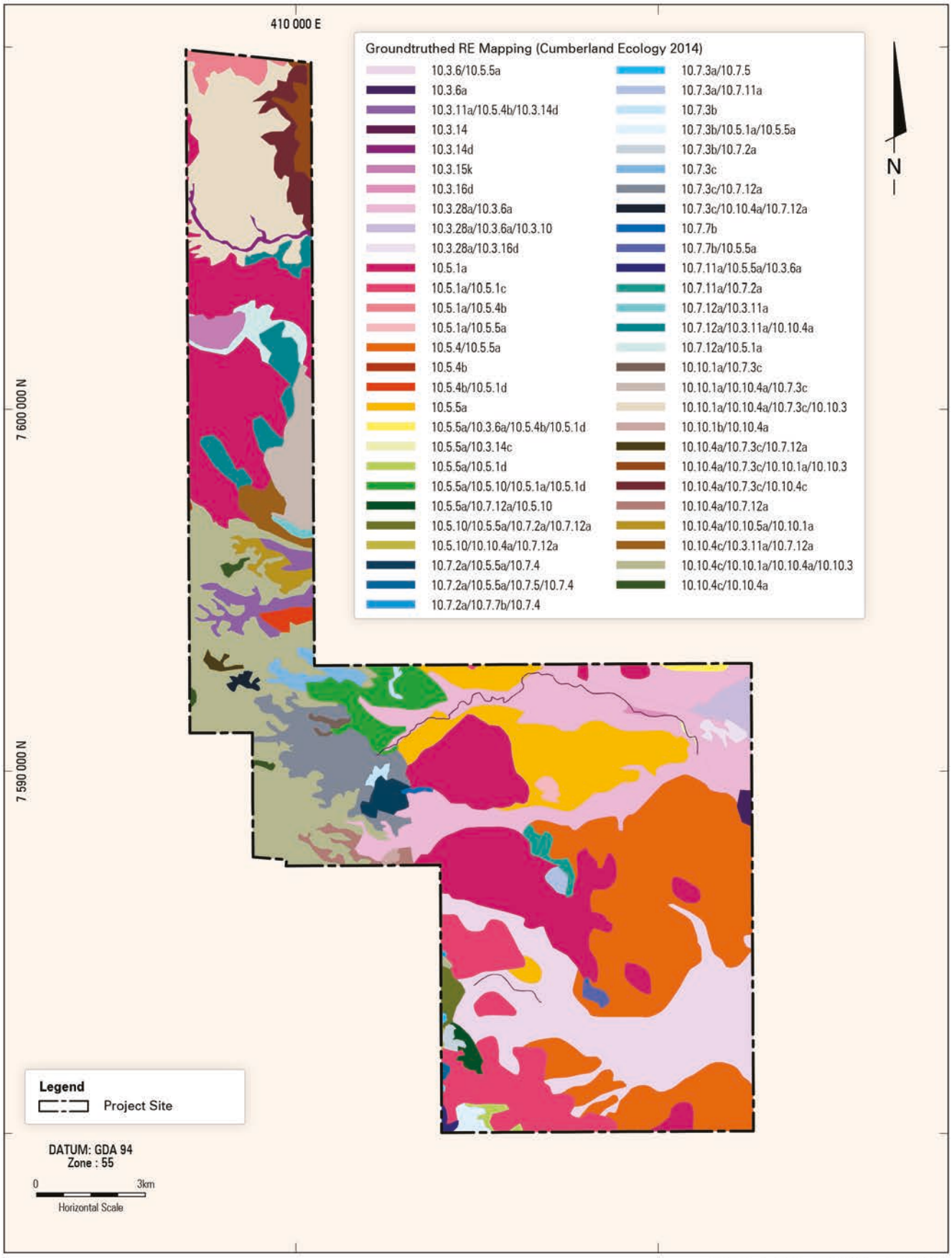


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Broad Vegetation Associations and Surface Water Features within the Study Area

FIGURE 10

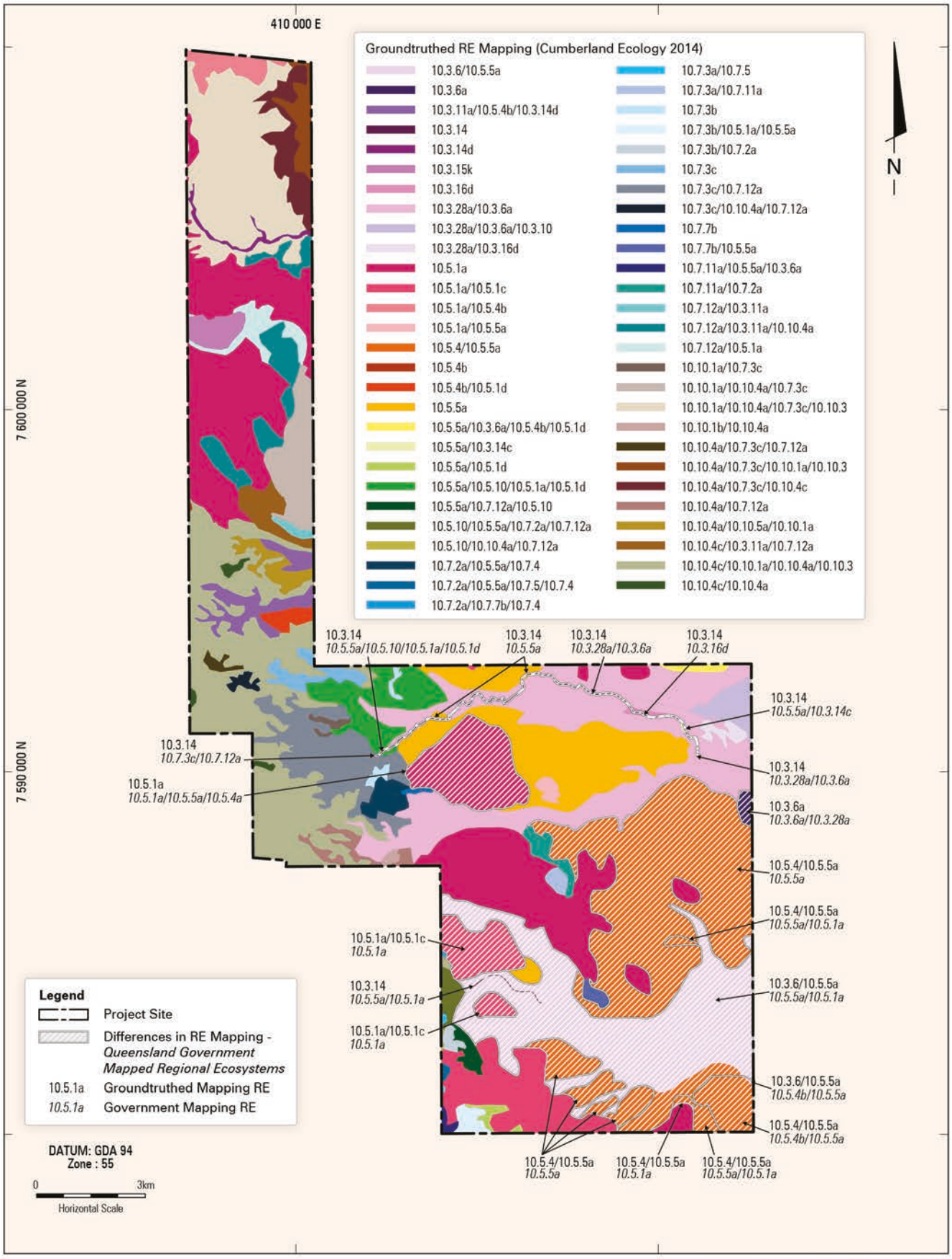


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Groundtruthed Regional Ecosystems within the Study Area

FIGURE 11

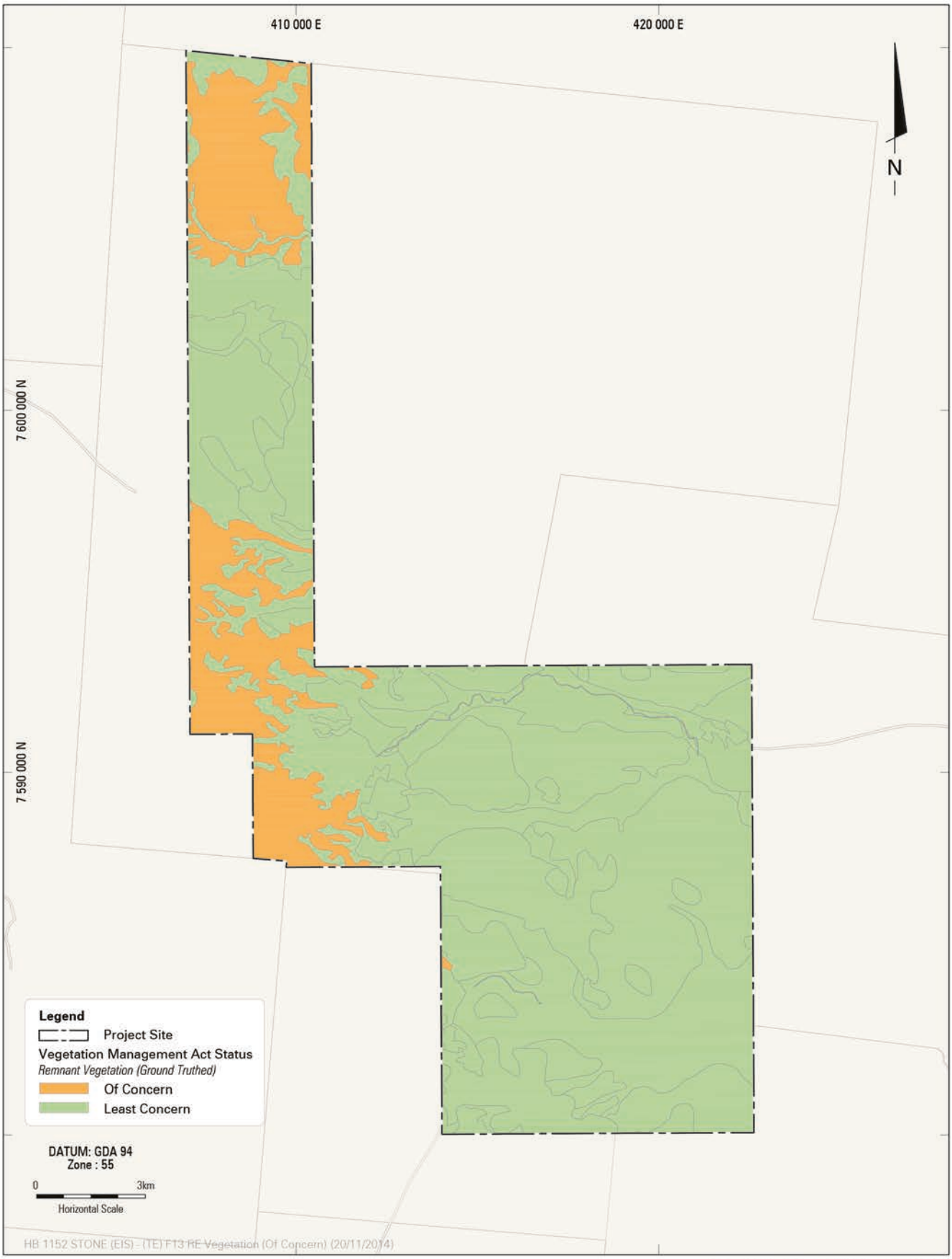


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Compared Regional Ecosystem Mapping

FIGURE 12

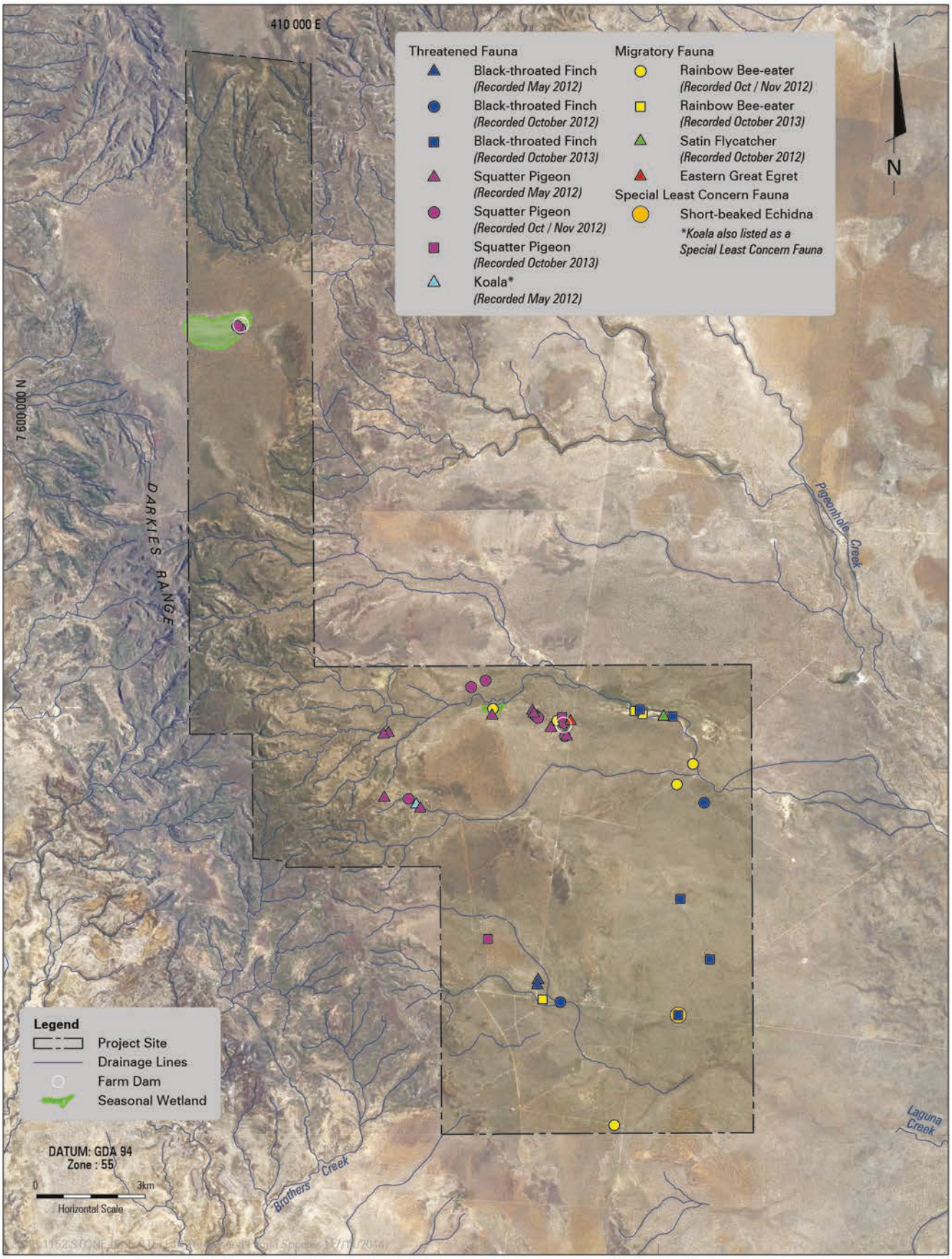


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Of Concern Regional Ecosystem Recorded

FIGURE 13



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Threatened, Special Least Concern and Migratory Fauna Species Records

FIGURE 14

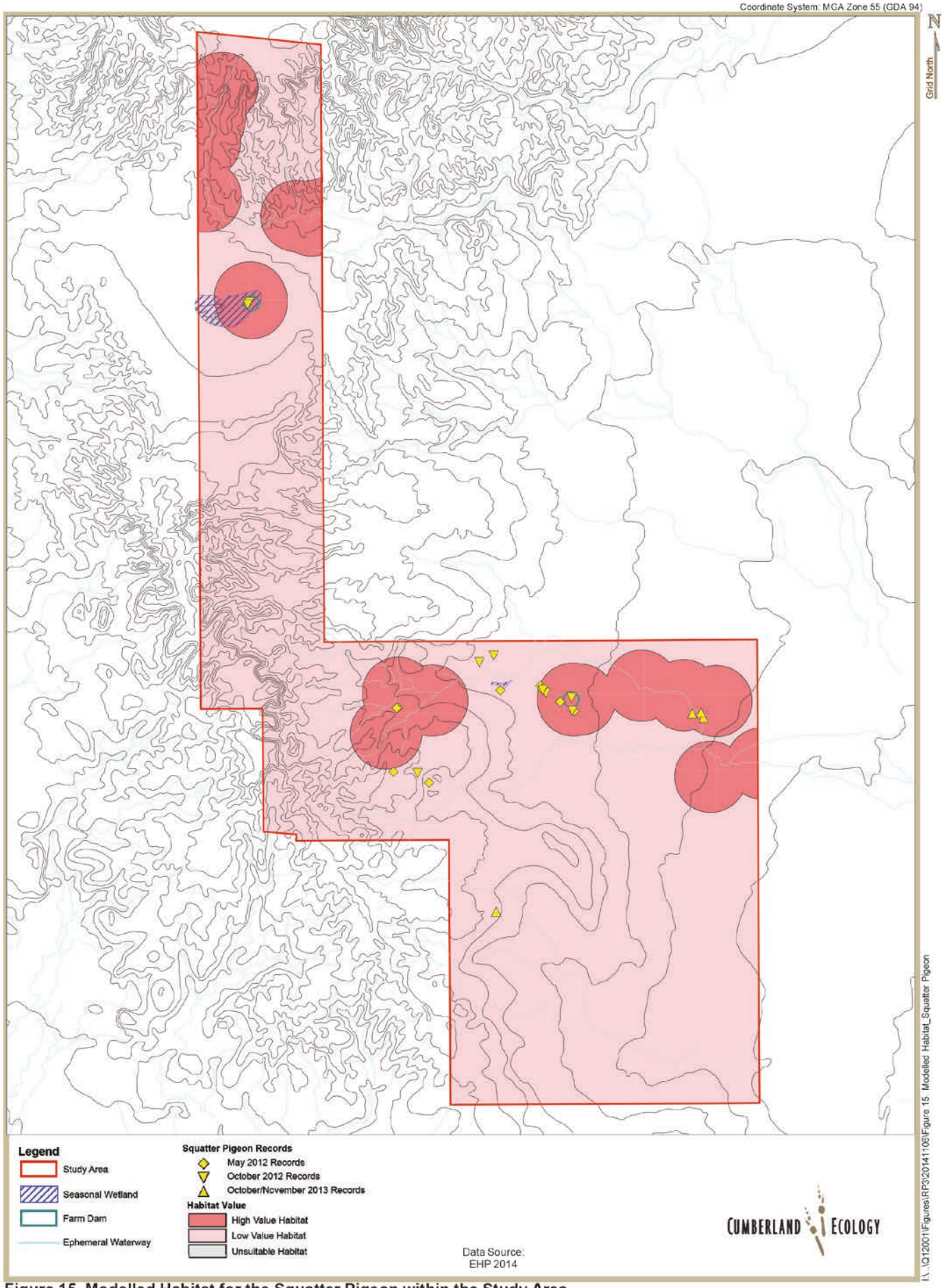


Figure 15. Modelled Habitat for the Squatter Pigeon within the Study Area

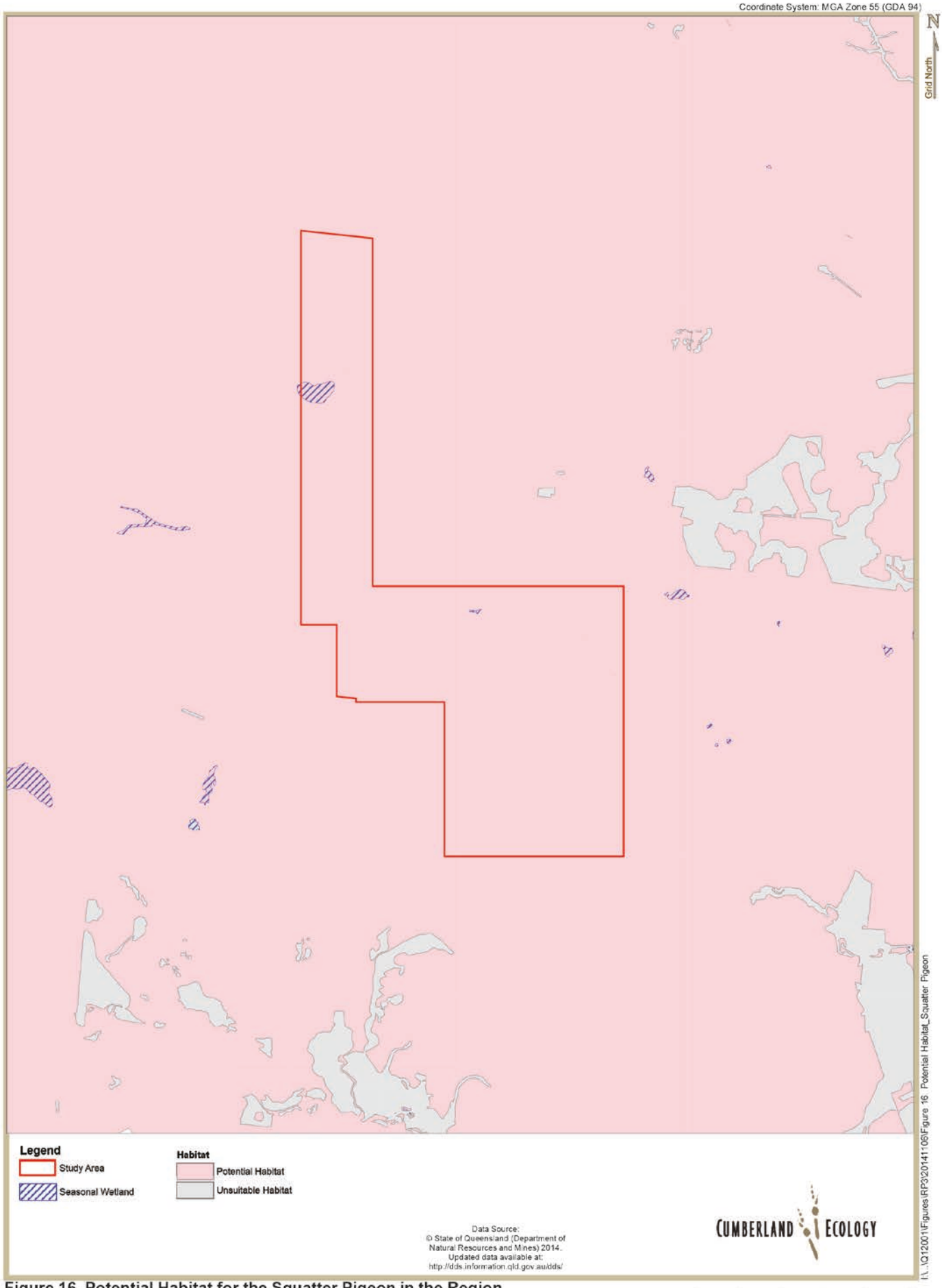


Figure 16. Potential Habitat for the Squatter Pigeon in the Region

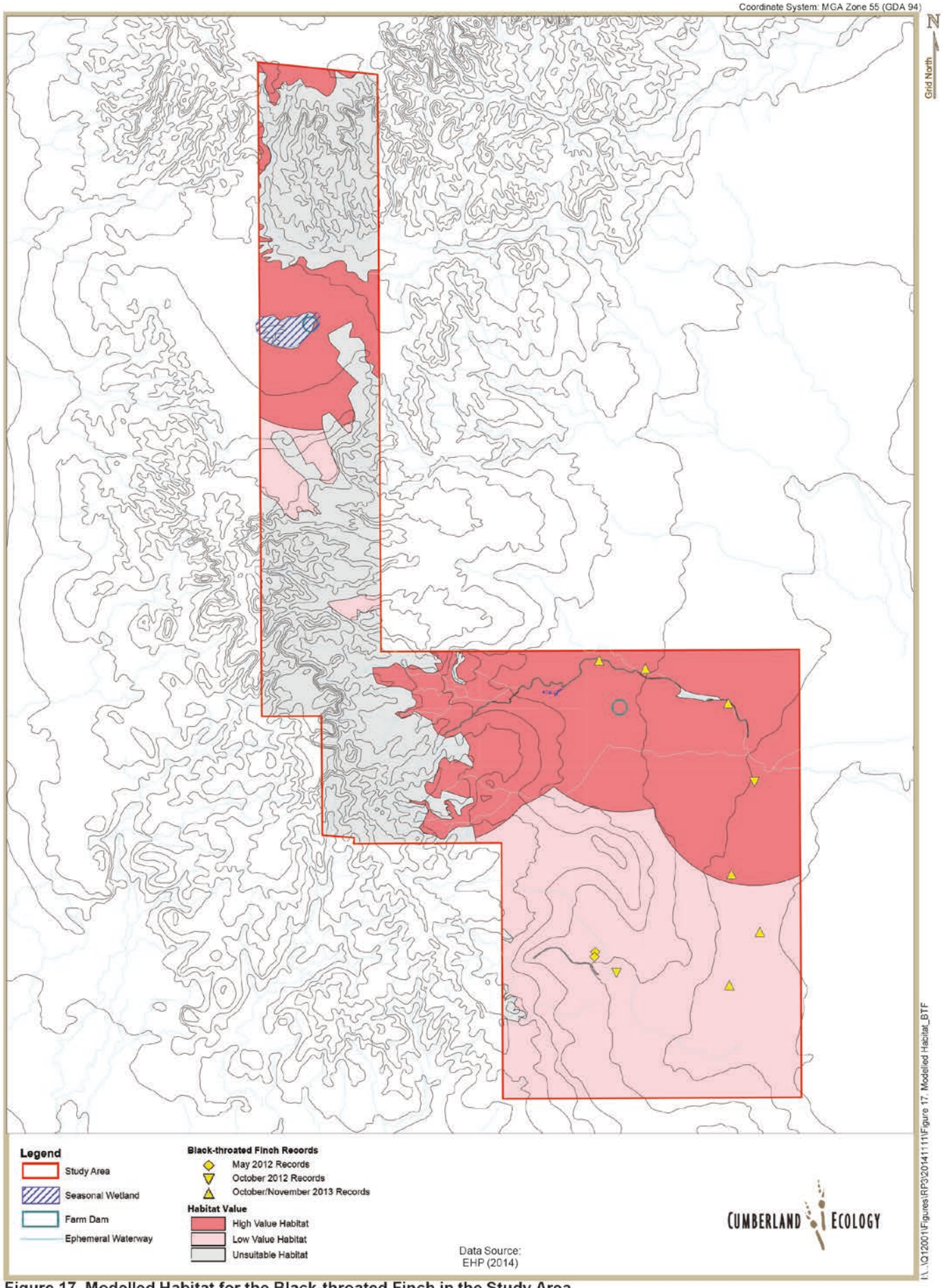


Figure 17. Modelled Habitat for the Black-throated Finch in the Study Area

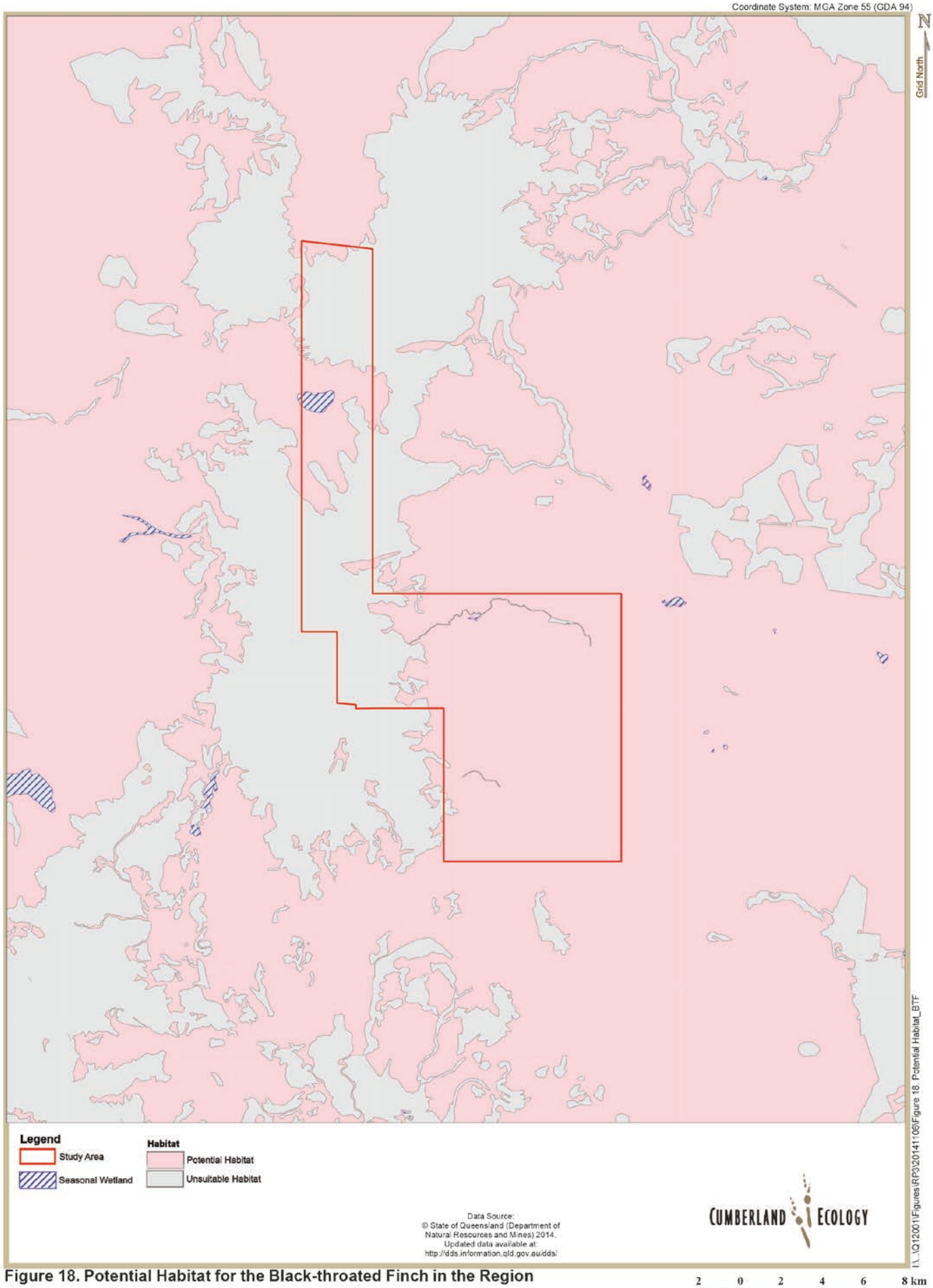


Figure 18. Potential Habitat for the Black-throated Finch in the Region

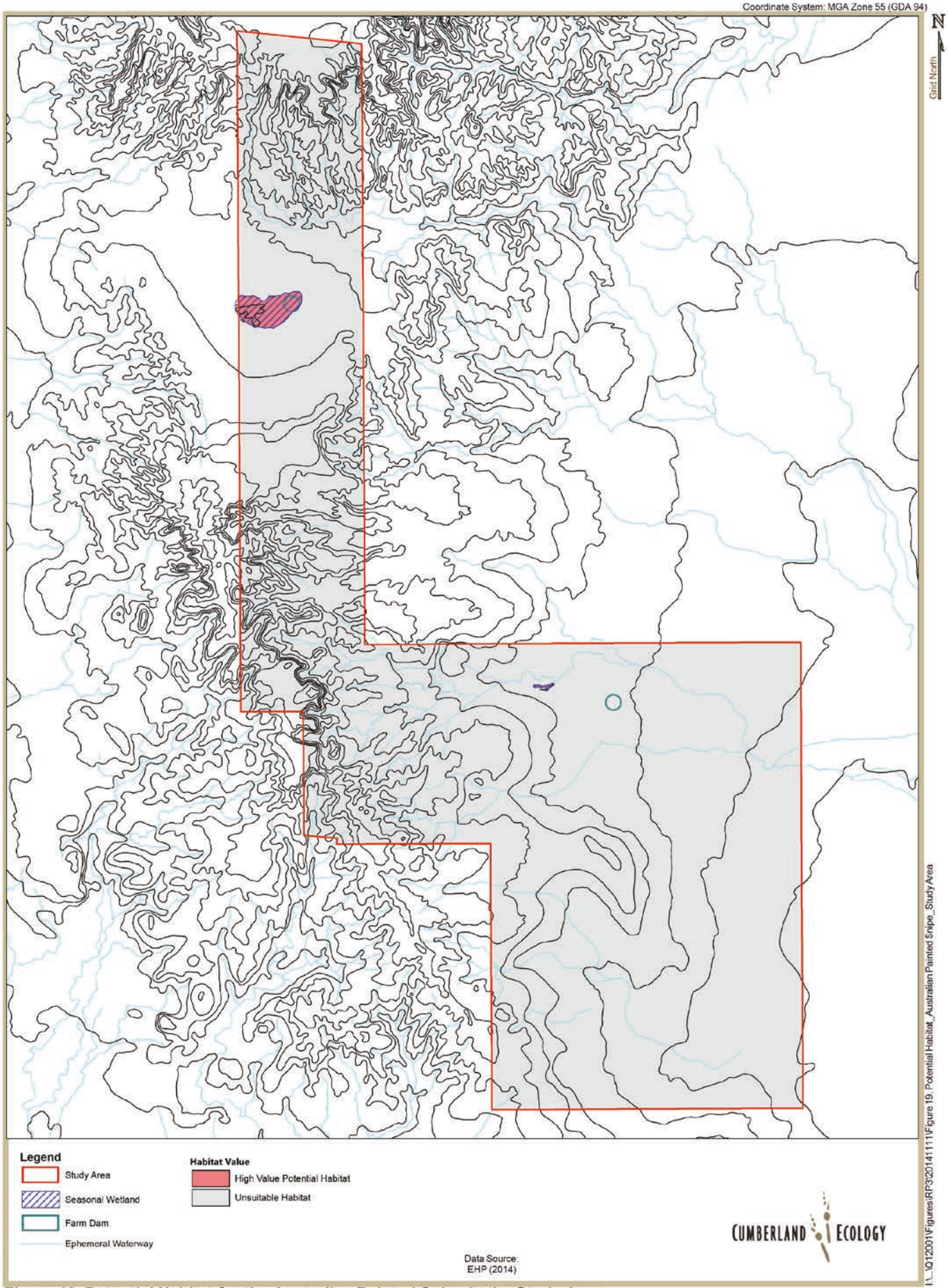


Figure 19. Potential Habitat for the Australian Painted Snipe in the Study Area

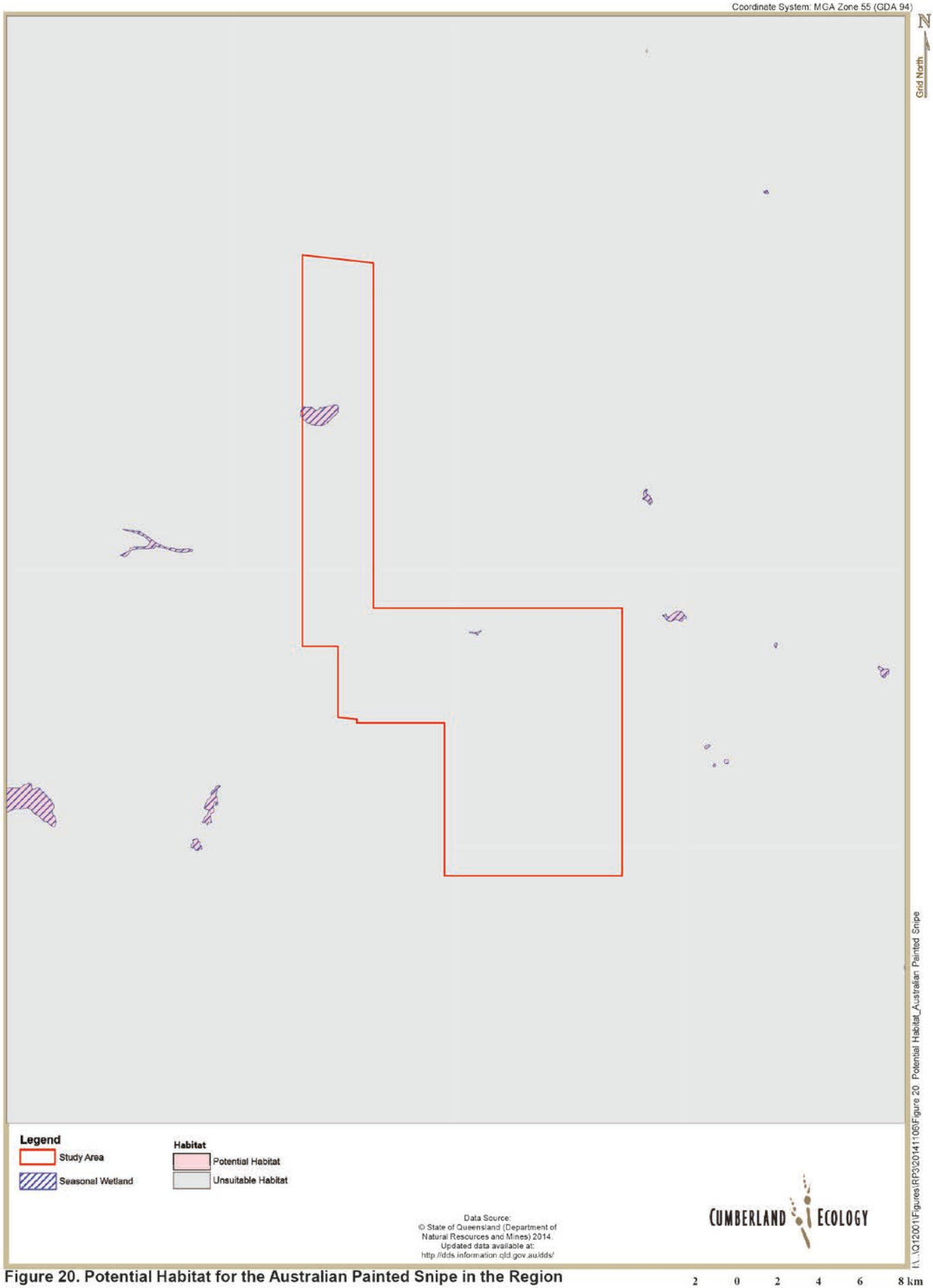


Figure 20. Potential Habitat for the Australian Painted Snipe in the Region

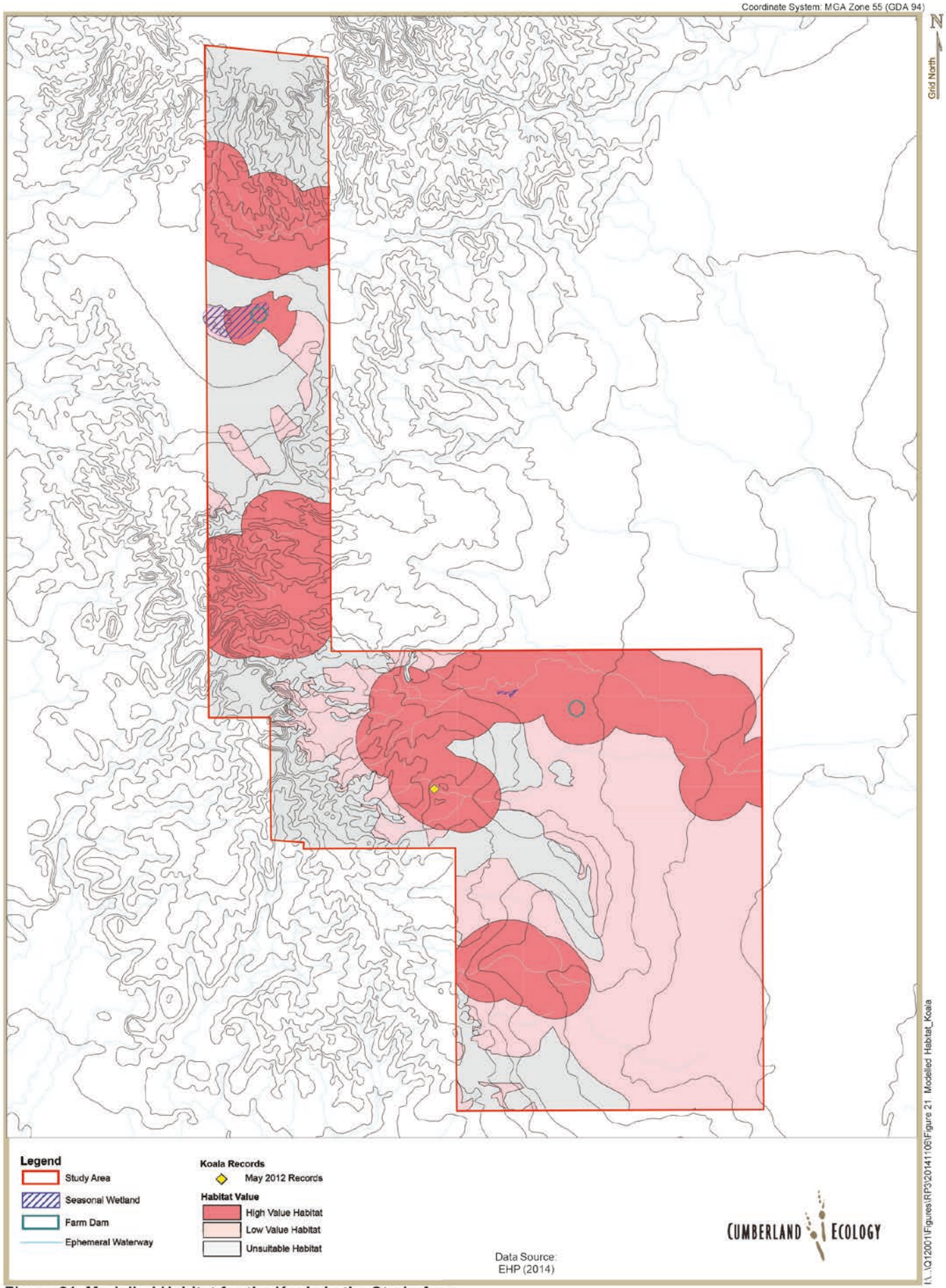


Figure 21. Modelled Habitat for the Koala in the Study Area

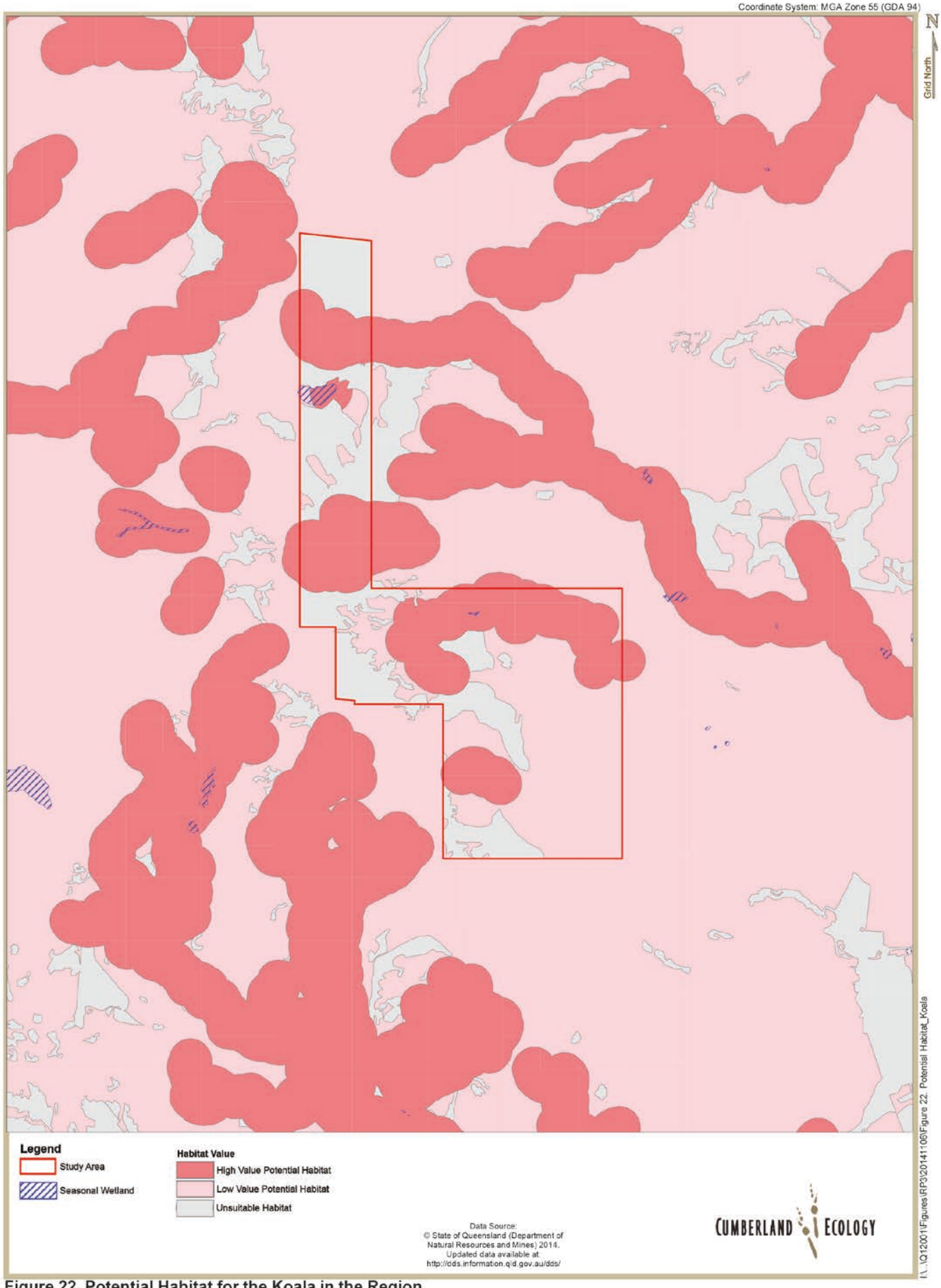


Figure 22. Potential Habitat for the Koala in the Region

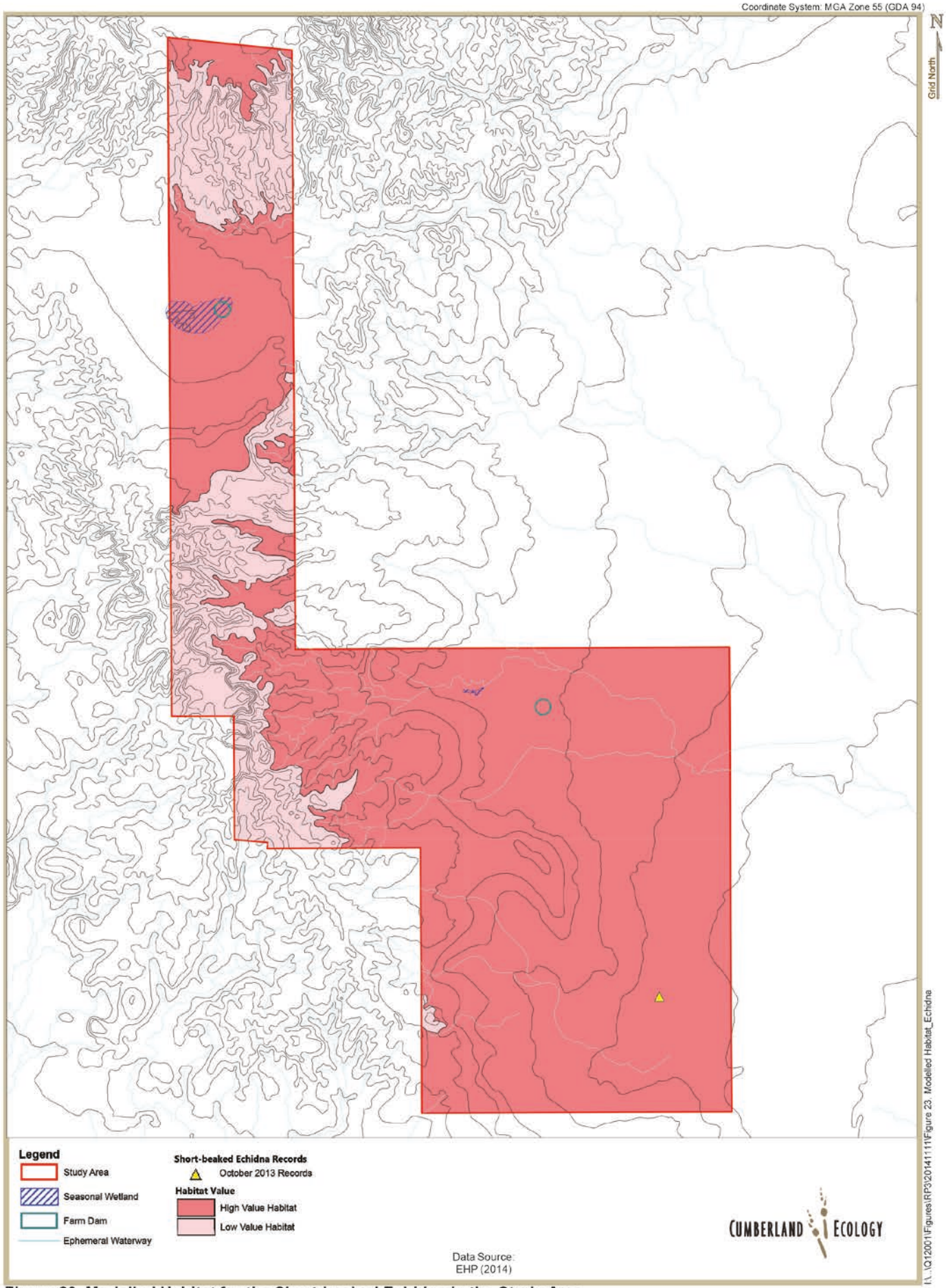


Figure 23. Modelled Habitat for the Short-beaked Echidna in the Study Area

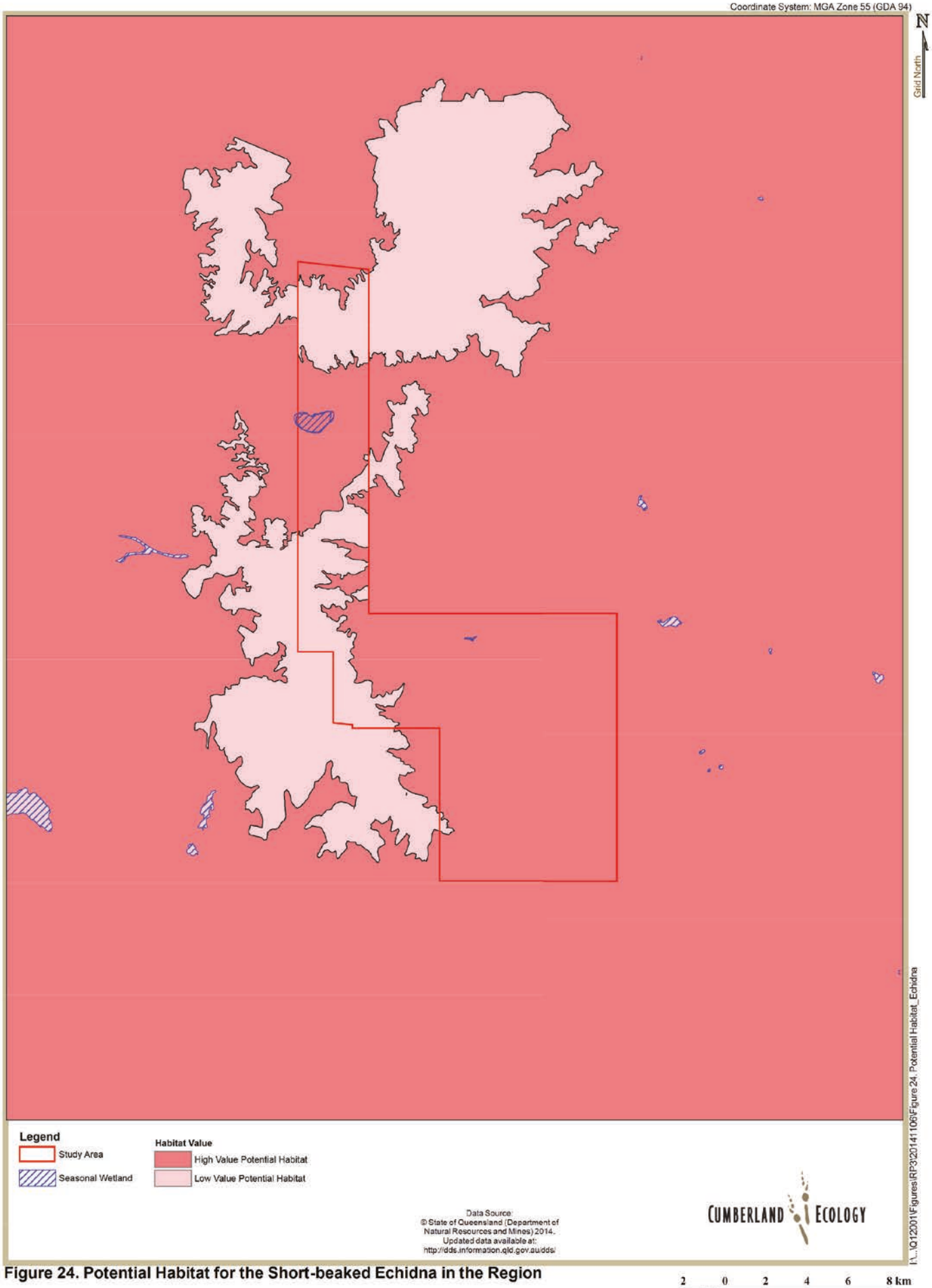
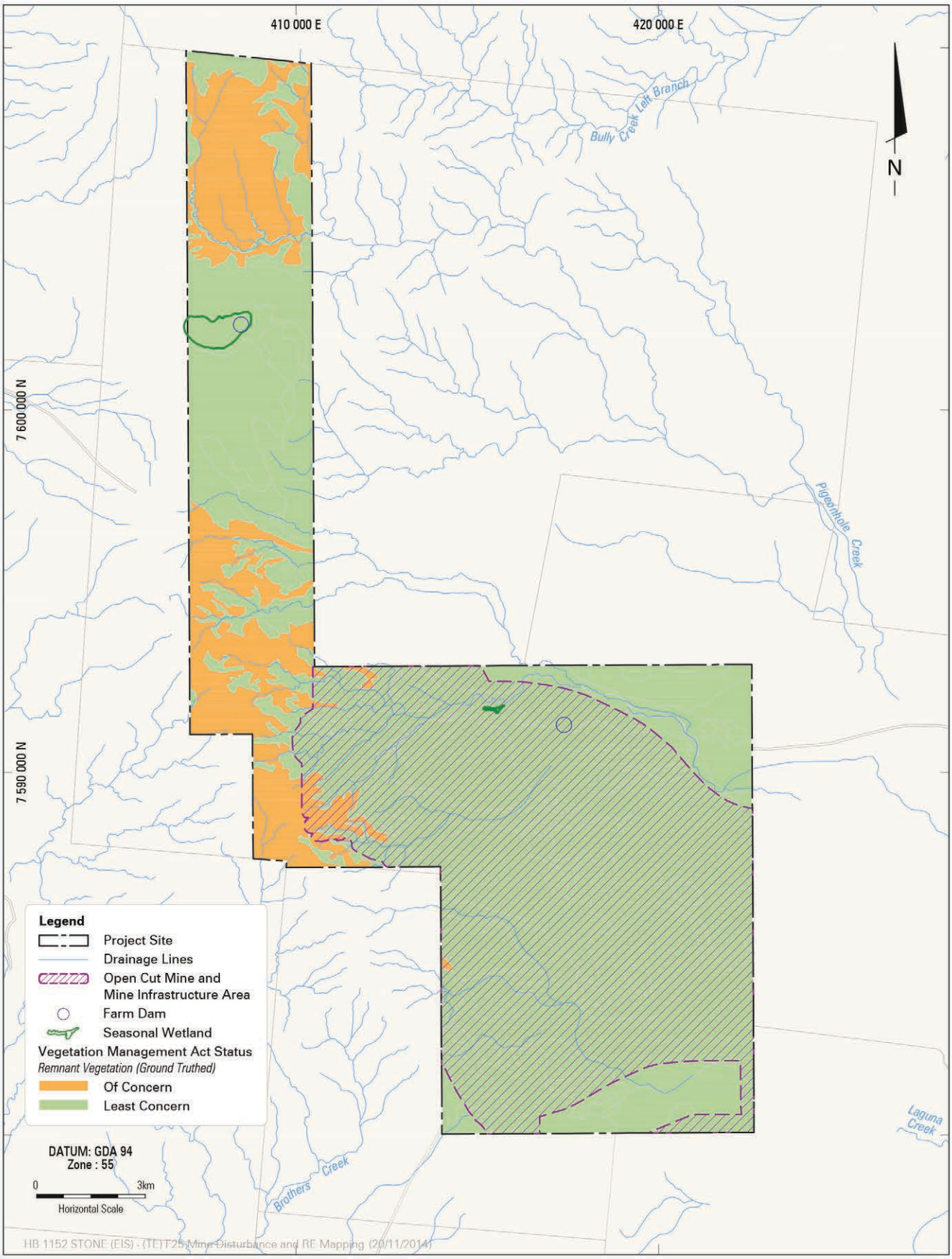


Figure 24. Potential Habitat for the Short-beaked Echidna in the Region

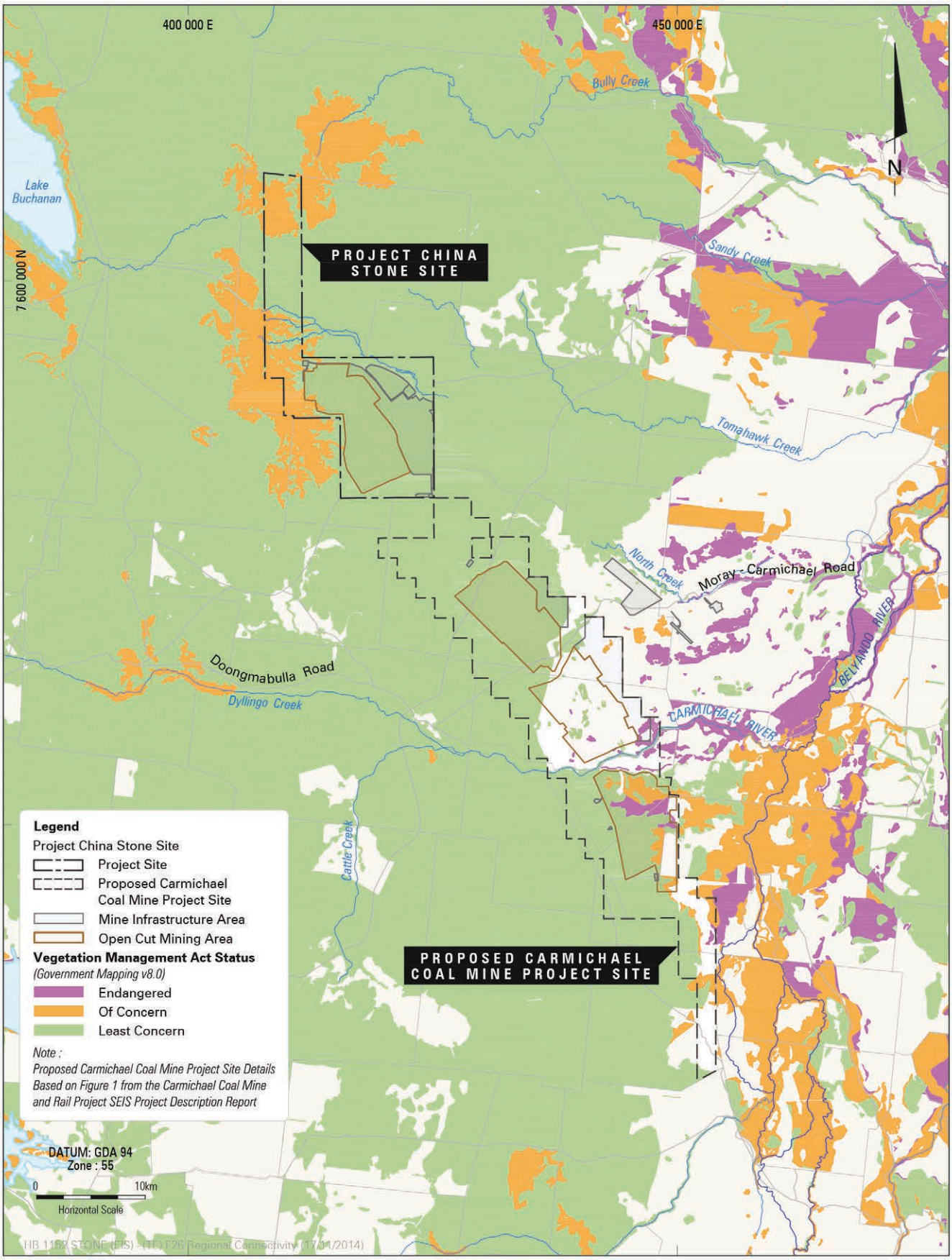


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Open Cut Mine and Mine Infrastructure Area Clearing Footprint

FIGURE 25

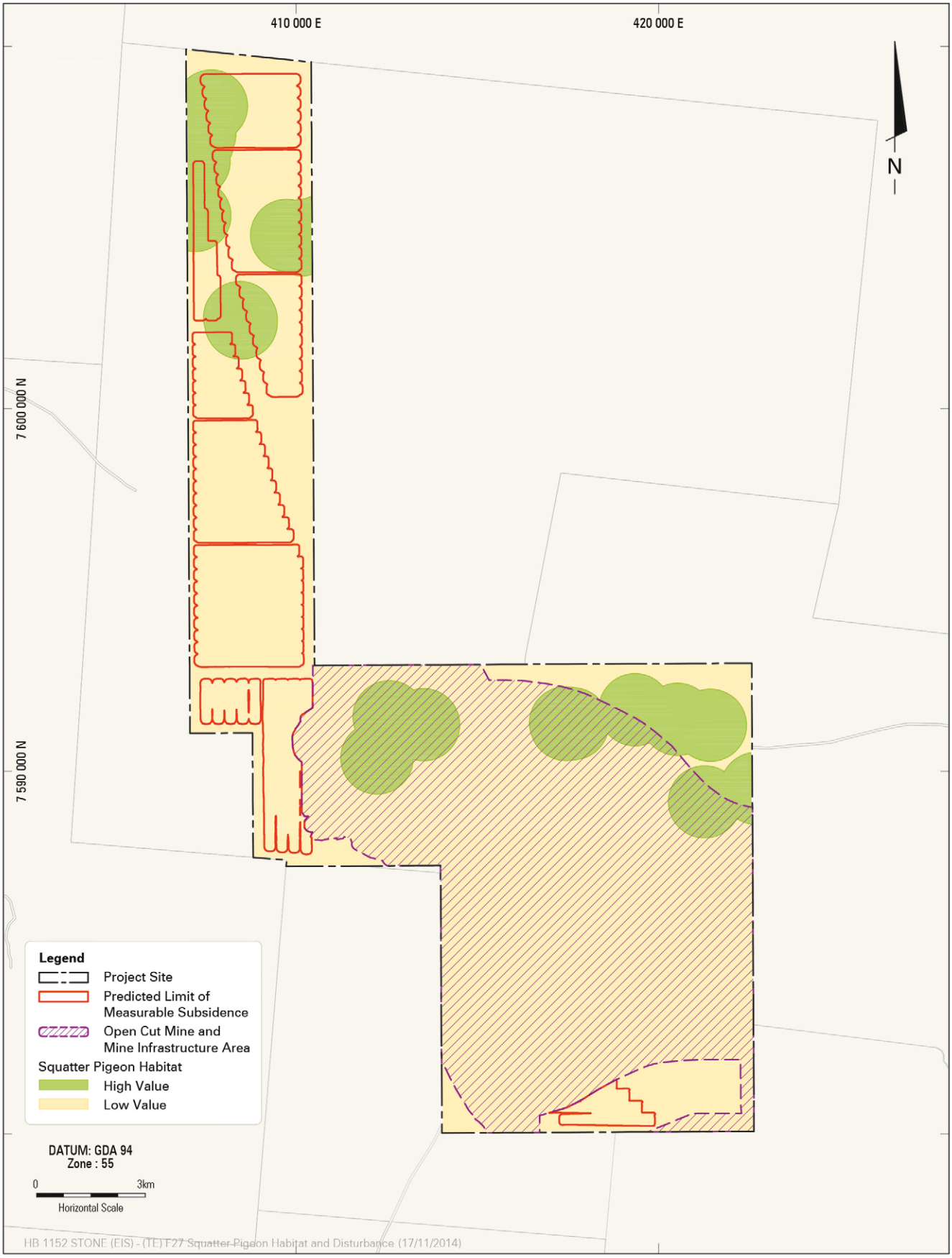


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Regional Vegetation Connectivity

FIGURE 26

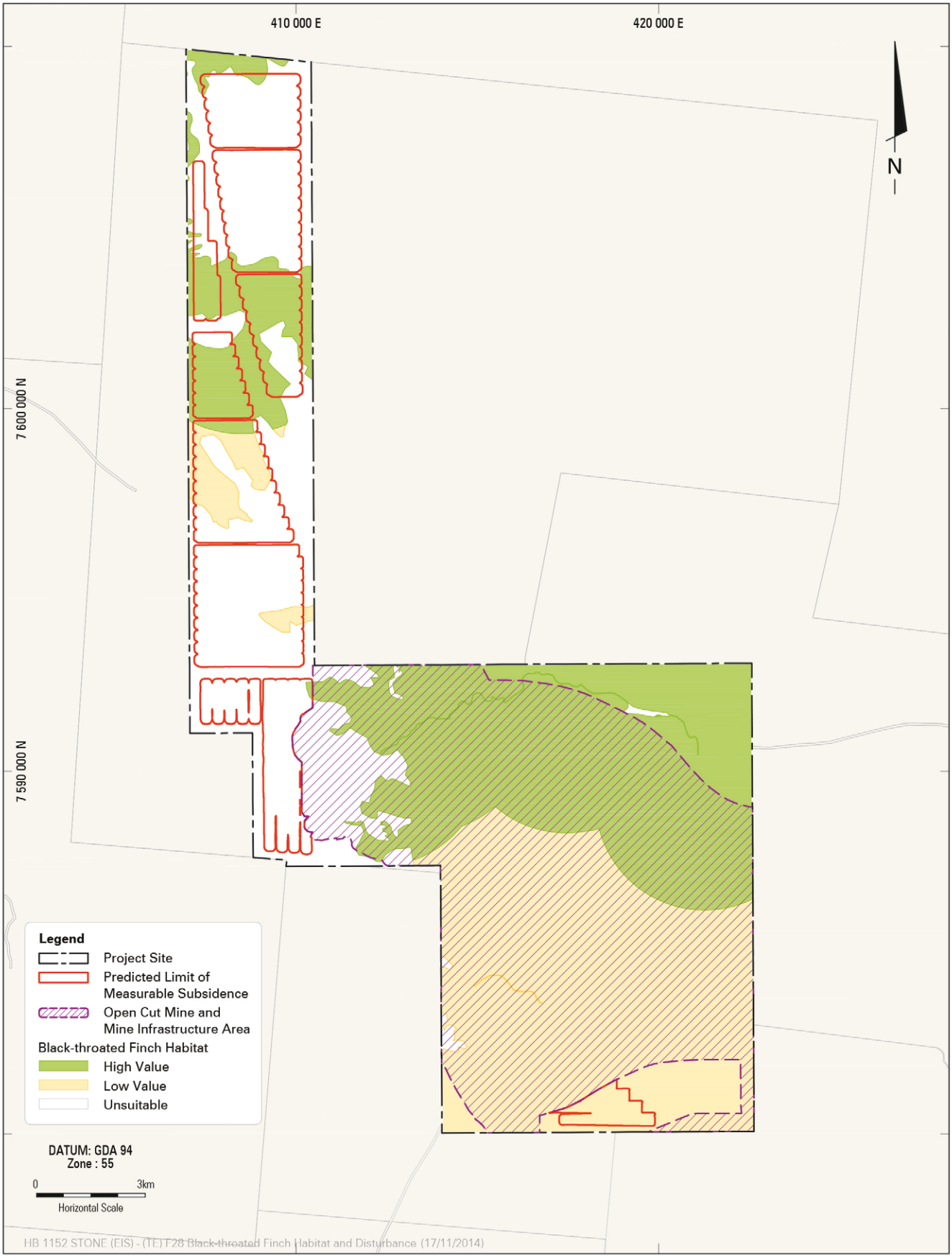


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Squatter Pigeon Habitat within the Clearing Footprint and Limit of Measurable Subsidence

FIGURE 27

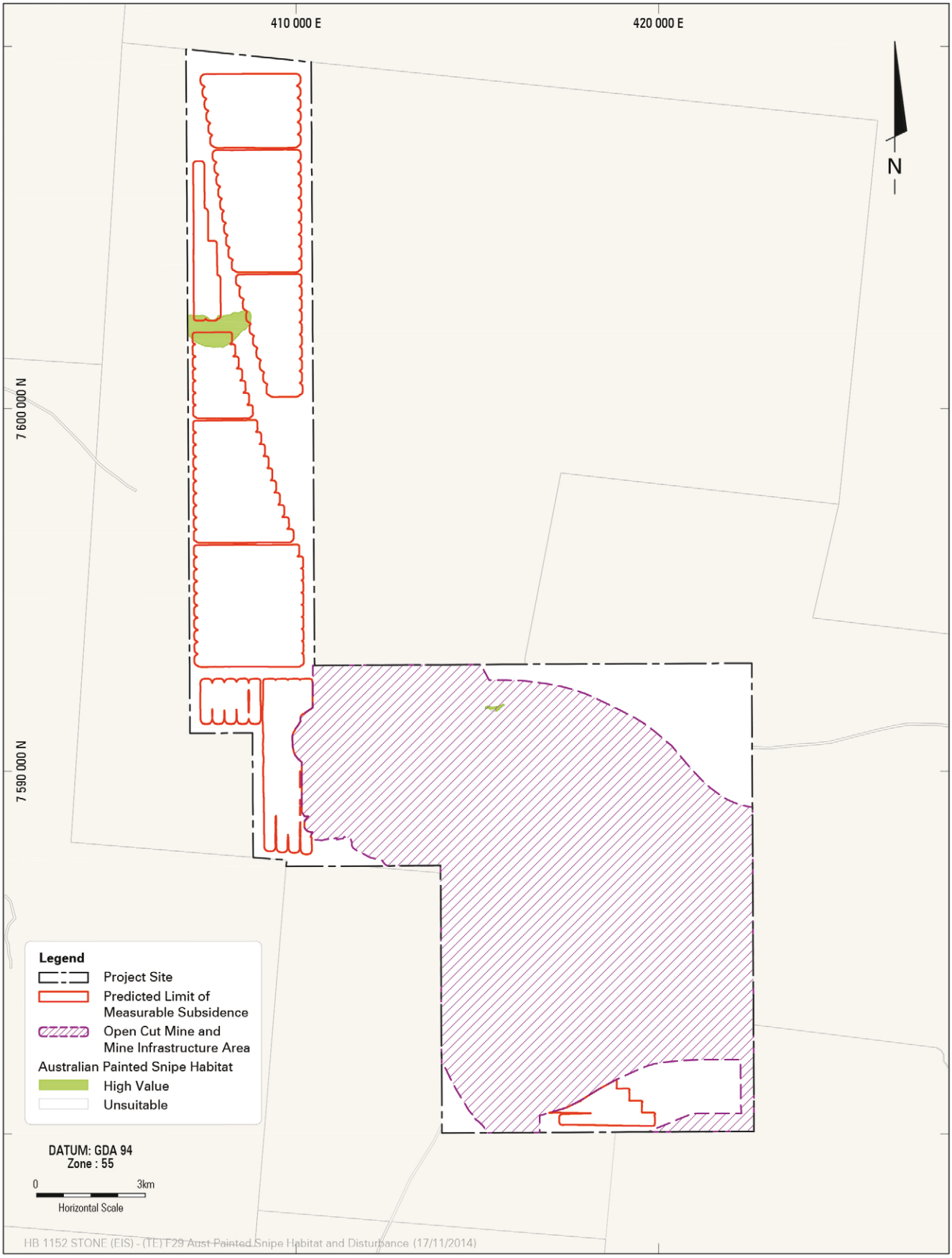


PROJECT CHINA STONE

MACMINES AUSTASIA | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Black-throated Finch Habitat within the Clearing Footprint and Limit of Measurable Subsidence

FIGURE 28

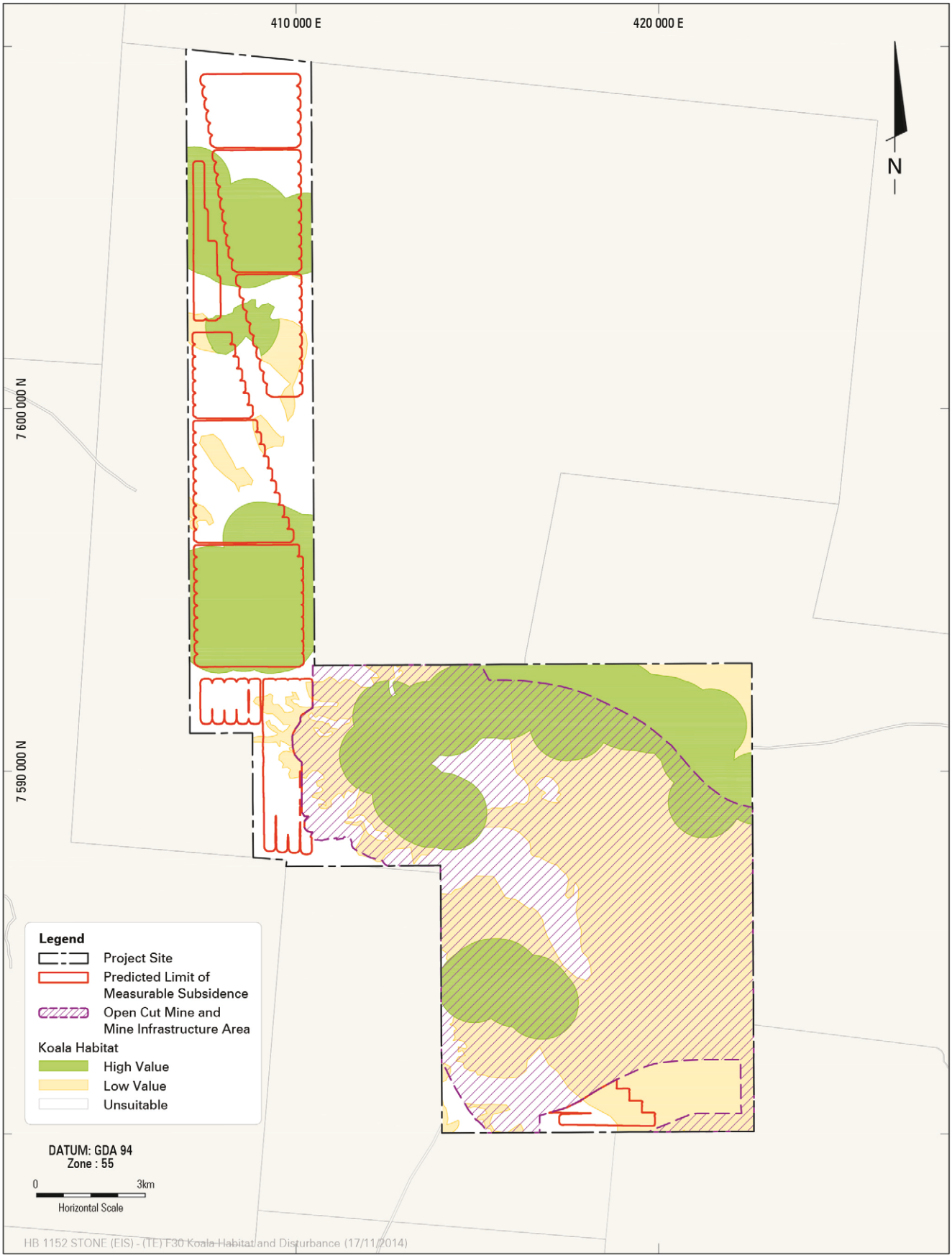


PROJECT CHINA STONE

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Australian Painted Snipe Habitat within the Clearing Footprint and Limit of Measurable Subsidence

FIGURE 29



PROJECT CHINA STONE

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Koala Habitat within the Clearing Footprint and Limit of Measurable Subsidence

FIGURE 30



PROJECT CHINA STONE

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Short-beaked Echidna Habitat within the Clearing Footprint and Limit of Measurable Subsidence

FIGURE 31

Appendix A

EPBC Act Protected Matters Search Tool Report

Australian Government
Department of the Environment

EPBC Act Protected Matters Report

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

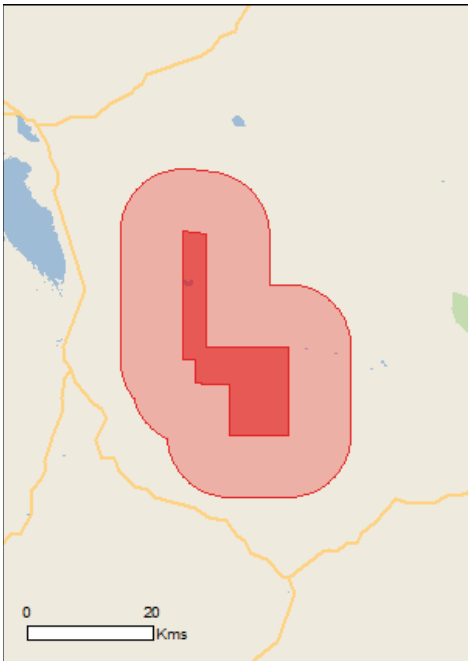
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 01/08/14 07:51:00

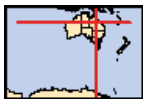
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



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

Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	9
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

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

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	8
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine	None

Extra Information

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

Place on the RNE:	1
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	9
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Geophaps scripta scripta		
Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat likely to occur within area
Neochmia ruficauda ruficauda		
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta		
Black-throated Finch (southern) [64447]	Endangered	Species or species habitat known to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Macrotis lagotis		
Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Denisonia maculata		
Ornamental Snake [1193]	Vulnerable	Species or species habitat may occur within area
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Anseranas semipalmata		
Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Lake Buchanan and Catchment	QLD	Registered

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Frogs		
Bufo marinus		
Cane Toad [1772]		Species or species habitat likely to occur within area
Rhinella marina		
Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Jatropha gossypifolia		
Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Parkinsonia aculeata		
Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area

Coordinates

-21.765 146.25111,-21.88167 146.25111,-21.88167 146.16778,-21.815 146.16778,-21.815 146.12639,-21.81333 146.12667,-21.81278 146.11778,-21.78167 146.11778,-21.78167 146.10111,-21.61111 146.10111,-21.61472 146.13444,-21.765 146.13444,-21.765 146.25111

Caveat

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Acknowledgements

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

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

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

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

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GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix B

Queensland Wildlife Online Database Search Results

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -21.8818
Longitude: 146.2094
Distance: 25
Email: cannandale@hansenbailey.com.au
Date submitted: Thursday 04 Sep 2014 11:29:45
Date extracted: Thursday 04 Sep 2014 11:30:14

The number of records retrieved = 556

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			4
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		4
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		5
animals	amphibians	Hylidae	*Cyclorana brevipes*	superb collared frog		C		2
animals	amphibians	Hylidae	*Litoria rothii*	northern laughing treefrog		C		3
animals	amphibians	Hylidae	*Litoria inermis*	bumpy rocketfrog		C		5/1
animals	amphibians	Hylidae	*Cyclorana novaehollandiae*	eastern snapping frog		C		6/3
animals	amphibians	Hylidae	*Litoria nasuta*	striped rocketfrog		C		1/1
animals	amphibians	Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		C		3/1
animals	amphibians	Myobatrachidae	*Crinia deserticola*	chirping froglet		C		1
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		21
animals	birds	Acanthizidae	*Acanthiza nana*	yellow thornbill		C		1
animals	birds	Acanthizidae	*Gerygone fusca*	western gerygone		C		3
animals	birds	Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		C		2
animals	birds	Acanthizidae	*Gerygone albogularis*	white-throated gerygone		C		9
animals	birds	Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		C		12
animals	birds	Acanthizidae	*Acanthiza uropygialis*	chestnut-rumped thornbill		C		2
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		5
animals	birds	Accipitridae	*Lophoictinia isura*	square-tailed kite		NT		2
animals	birds	Accipitridae	*Milvus migrans*	black kite		C		1
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		1
animals	birds	Acrocephalidae	*Acrocephalus australis*	Australian reed-warbler		SL		1
animals	birds	Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		C		38
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		1
animals	birds	Anatidae	*Malacorhynchus membranaceus*	pink-eared duck		C		2
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		1
animals	birds	Anatidae	*Aythya australis*	hardhead		C		3
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		3
animals	birds	Anhingidae	*Anhinga novaehollandiae*	Australasian darter		C		3
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		2
animals	birds	Ardeidae	*Egretta garzetta*	little egret		C		2
animals	birds	Ardeidae	*Nycticorax caledonicus*	Nankeen night-heron		C		1
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		4
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		1
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		20
animals	birds	Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		C		1
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		40
animals	birds	Artamidae	*Artamus minor*	little woodswallow		C		2
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		7
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		28
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		2
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		2
animals	birds	Cacatuidae	*Eolophus roseicapillus*	galah		C		1
animals	birds	Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		C		4
animals	birds	Cacatuidae	*Nymphicus hollandicus*	cockatiel		C		1
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		14

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animals	birds	Campephagidae	*Lalage sueurii*	white-winged triller		C		8
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		25
animals	birds	Campephagidae	*Coracina maxima*	ground cuckoo-shrike		C		2
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		C		4
animals	birds	Charadriidae	*Vanellus miles miles*	masked lapwing (northern subspecies)		C		1
animals	birds	Charadriidae	*Vanellus miles novaehollandiae*	masked lapwing (southern subspecies)		C		2
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		1
animals	birds	Charadriidae	*Elseyornis melanops*	black-fronted dotterel		C		6
animals	birds	Climacteridae	*Climacteris picumnus*	brown treecreeper		C		8
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	13
animals	birds	Columbidae	*Phaps chalcoptera*	common bronzewing		C		1
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		10
animals	birds	Columbidae	*Geopelia cuneata*	diamond dove		C		1
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		11
animals	birds	Coraciidae	*Eurystomus orientalis*	dollarbird		C		1
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		20
animals	birds	Corvidae	*Corvus bennetti*	little crow		C		1
animals	birds	Corvidae	*Corvus coronoides*	Australian raven		C		17
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		18
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		6
animals	birds	Cuculidae	*Cacomantis pallidus*	pallid cuckoo		C		3
animals	birds	Cuculidae	*Cacomantis variolosus*	brush cuckoo		C		2
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		3
animals	birds	Estrildidae	*Neochmia modesta*	plum-headed finch		C		2
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		4
animals	birds	Estrildidae	*Poephila cincta cincta*	black-throated finch (white-rumped subspecies)		E	E	25
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		7
animals	birds	Eurostopodidae	*Eurostopodus argus*	spotted nightjar		C		14
animals	birds	Falconidae	*Falco cenchroides*	Nankeen kestrel		C		7
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		9
animals	birds	Gruidae	*Grus rubicunda*	brolga		C		4
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		12
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		8
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		13
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		3
animals	birds	Maluridae	*Malurus lamberti*	variegated fairy-wren		C		21
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		5
animals	birds	Megaluridae	*Cincloramphus mathewsi*	rufous songlark		C		6
animals	birds	Megaluridae	*Eremiornis carteri*	spinifexbird		C		4
animals	birds	Meliphagidae	*Ptilotula plumulus*	grey-fronted honeyeater		C		11
animals	birds	Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		C		18
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		2
animals	birds	Meliphagidae	*Acanthagenys rufogularis*	spiny-cheeked honeyeater		C		20
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		7
animals	birds	Meliphagidae	*Manorina flavigula*	yellow-throated miner		C		22

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animals	birds	Meliphagidae	*Gavicalis virescens*	singing honeyeater		C		19
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		13
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		47
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		1
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		18
animals	birds	Meliphagidae	*Ptilotula penicillatus*	white-plumed honeyeater		C		8
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		SL		11
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		10
animals	birds	Monarchidae	*Myiagra inquieta*	restless flycatcher		C		11
animals	birds	Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		C		1
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		15
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		6
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		8
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		20
animals	birds	Pachycephalidae	*Oreoica gutturalis*	crested bellbird		C		21
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		24
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		22
animals	birds	Pelecanidae	*Pelecanus conspicillatus*	Australian pelican		C		1
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		30
animals	birds	Petroicidae	*Melanodryas cucullata*	hooded robin		C		4
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		2
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		19
animals	birds	Podicipedidae	*Poliocephalus poliocephalus*	hoary-headed grebe		C		1
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		2
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		14
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		12
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		7
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		14
animals	birds	Psittacidae	*Melopsittacus undulatus*	budgerigar		C		3
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus maculatus*	spotted bowerbird		C		4
animals	birds	Rallidae	*Gallinula tenebrosa*	dusky moorhen		C		1
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		27
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		6
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		17
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		2
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis		C		2
animals	birds	Threskiornithidae	*Platalea regia*	royal spoonbill		C		1
animals	birds	Threskiornithidae	*Platalea flavipes*	yellow-billed spoonbill		C		1
animals	mammals	Canidae	*Canis lupus dingo*	dingo				1
animals	mammals	Dasyuridae	*Sminthopsis macroura*	stripe-faced dunnart		C		10
animals	mammals	Emballonuridae	*Saccolaimus flaviventris*	yellow-bellied sheathtail bat		C		1
animals	mammals	Felidae	*Felis catus*	cat	Y			3
animals	mammals	Leporidae	*Oryctolagus cuniculus*	rabbit	Y			2
animals	mammals	Macropodidae	*Macropus rufus*	red kangaroo		C		12
animals	mammals	Macropodidae	*Wallabia bicolor*	swamp wallaby		C		1
animals	mammals	Macropodidae	*Macropus robustus*	common wallaroo		C		6

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animals	mammals	Macropodidae	*Macropus giganteus*	eastern grey kangaroo		C		12
animals	mammals	Macropodidae	*Lagorchestes conspicillatus*	spectacled hare-wallaby		C		1
animals	mammals	Molossidae	*Chaerephon jobensis*	northern freetail bat		C		1
animals	mammals	Muridae	*Leggadina lakedownensis*	Lakeland Downs mouse		C		1
animals	mammals	Muridae	*Pseudomys delicatulus*	delicate mouse		C		3
animals	mammals	Muridae	*Pseudomys desertor*	desert mouse		C		11
animals	mammals	Muridae	*Pseudomys patrius*	eastern pebble-mound mouse		C		1
animals	mammals	Muridae	*Mus musculus*	house mouse	Y			1
animals	mammals	Petauridae	*Petaurus breviceps*	sugar glider		C		2
animals	mammals	Petauridae	*Petaurus norfolcensis*	squirrel glider		C		1
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		4
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		SL	V	3
animals	mammals	Potoroidae	*Aepyprymnus rufescens*	rufous bettong		C		1
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox		C		2
animals	mammals	Suidae	*Sus scrofa*	pig	Y			1
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		SL		2
animals	mammals	Vespertilionidae	*Vespadelus finlaysoni*	Finlayson's cave bat		C		1
animals	mammals	Vespertilionidae	*Nyctophilus geoffroyi*	lesser long-eared bat		C		3
animals	mammals	Vespertilionidae	*Chalinolobus picatus*	little pied bat		NT		1
animals	mammals	Vespertilionidae	*Vespadelus baverstocki*	inland forest bat		C		1
animals	mammals	Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat		C		3
animals	mammals	Vespertilionidae	*Scotorepens greyii*	little broad-nosed bat		C		5
animals	mammals	Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat		C		1
animals	mammals	Vespertilionidae	*Chalinolobus morio*	chocolate wattled bat		C		1
animals	reptiles	Agamidae	*Amphibolurus gilberti*	Gilbert's dragon		C		1
animals	reptiles	Agamidae	*Diporiphora australis*			C		3
animals	reptiles	Agamidae	*Ctenophorus nuchalis*	central netted dragon		C		6
animals	reptiles	Agamidae	*Amphibolurus burnsi*			C		1
animals	reptiles	Agamidae	*Pogona barbata*	bearded dragon		C		11
animals	reptiles	Boidae	*Aspidites melanocephalus*	black-headed python		C		3
animals	reptiles	Carphodactylidae	*Nephrurus asper*	spiny knob-tailed gecko		C		2
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		1
animals	reptiles	Colubridae	*Boiga irregularis*	brown tree snake		C		1
animals	reptiles	Diplodactylidae	*Rhynchoedura ornata sensu lato*	beaked gecko		C		2
animals	reptiles	Diplodactylidae	*Diplodactylus conspicillatus*	fat-tailed diplodactylus		C		4
animals	reptiles	Diplodactylidae	*Lucasium steindachneri*	Steindachner's gecko		C		7
animals	reptiles	Diplodactylidae	*Strophurus williamsi*	soft-spined gecko		C		4
animals	reptiles	Diplodactylidae	*Amalosia rhombifer*	zig-zag gecko		C		1
animals	reptiles	Diplodactylidae	*Oedura marmorata*	marbled velvet gecko		C		1
animals	reptiles	Elapidae	*Cryptophis boschmai*	Carpentaria whip snake		C		1
animals	reptiles	Elapidae	*Demansia psammophis*	yellow-faced whip snake		C		1
animals	reptiles	Elapidae	*Furina diadema*	red-naped snake		C		1
animals	reptiles	Elapidae	*Acanthophis praelongus*	northern death adder		C		1
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		C		10
animals	reptiles	Gekkonidae	*Gehyra catenata*			C		2
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard		C		1

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animals	reptiles	Scincidae	*Morethia taeniopleura*	fire-tailed skink		C		1
animals	reptiles	Scincidae	*Cryptoblepharus plagiocephalus sensu lato*			C		5
animals	reptiles	Scincidae	*Proablepharus tenuis*			C		1
animals	reptiles	Scincidae	*Ctenotus pantherinus*			C		5
animals	reptiles	Scincidae	*Morethia boulengeri*			C		3
animals	reptiles	Scincidae	*Ctenotus strauchii*			C		5
animals	reptiles	Scincidae	*Ctenotus spaldingi*			C		3
animals	reptiles	Scincidae	*Concinnia sokosoma*	stout bar-sided skink		C		1
animals	reptiles	Scincidae	*Ctenotus hebetior*			C		3
animals	reptiles	Scincidae	*Egernia striolata*	tree skink		C		2
animals	reptiles	Scincidae	*Carlia munda*			C		7
animals	reptiles	Scincidae	*Carlia schmeltzii*			C		1
animals	reptiles	Scincidae	*Ctenotus ingrami*			C		4
animals	reptiles	Scincidae	*Menetia greyii*			C		4
animals	reptiles	Scincidae	*Menetia maini*			C		2
animals	reptiles	Typhlopidae	*Ramphotyphlops ligatus*			C		1
animals	reptiles	Varanidae	*Varanus tristis*	black-tailed monitor		C		3
plants	ferns	Azollaceae	*Azolla pinnata*	ferny azolla		C		1
plants	ferns	Marsileaceae	*Marsilea hirsuta*	hairy nardoo		C		1
plants	higher dicots	Acanthaceae	*Dipteracanthus australasicus subsp. australasicus*			C		1/1
plants	higher dicots	Acanthaceae	*Rostellularia adscendens*			C		1/1
plants	higher dicots	Acanthaceae	*Nelsonia campestris*			C		1/1
plants	higher dicots	Aizoaceae	*Trianthema triquetra*	red spinach		C		2/2
plants	higher dicots	Aizoaceae	*Zaleya galericulata*			C		1/1
plants	higher dicots	Aizoaceae	*Trianthema sp. (Coorabulka R.W.Purdie 1404)*			C		2/2
plants	higher dicots	Amaranthaceae	*Alternanthera pungens*	khaki weed	Y			1/1
plants	higher dicots	Amaranthaceae	*Gomphrena sp. (Doongmabulla E.J.Thompson+ GAL137)*			C		1/1
plants	higher dicots	Amaranthaceae	*Ptilotus nobilis subsp. semilanatus*			C		1/1
plants	higher dicots	Amaranthaceae	*Gomphrena lanata*			C		1/1
plants	higher dicots	Amaranthaceae	*Alternanthera angustifolia*			C		1/1
plants	higher dicots	Apiaceae	*Eryngium plantagineum*	long eryngium		C		1/1
plants	higher dicots	Apiaceae	*Platysace valida*			C		1/1
plants	higher dicots	Apiaceae	*Centella asiatica*			C		1
plants	higher dicots	Apiaceae	*Eryngium fontanum*			E	E	5/3
plants	higher dicots	Araliaceae	*Hydrocotyle dipleura*			V		3/2
plants	higher dicots	Asteraceae	*Streptoglossa odora*			C		1/1
plants	higher dicots	Asteraceae	*Pluchea baccharoides*	narrow-leaved plains bush		C		2/2
plants	higher dicots	Asteraceae	*Pluchea rubelliflora*			C		1/1
plants	higher dicots	Asteraceae	*Calotis xanthosioidea*			C		1/1
plants	higher dicots	Asteraceae	*Parthenium hysterophorus*	parthenium weed	Y			4/4
plants	higher dicots	Asteraceae	*Chrysocephalum apiculatum*	yellow buttons		C		1/1
plants	higher dicots	Asteraceae	*Olearia arguta var. lanata*			C		1/1
plants	higher dicots	Asteraceae	*Apowollastonia spilanthoides*			C		1/1
plants	higher dicots	Asteraceae	*Emilia sonchifolia var. sonchifolia*		Y			1/1
plants	higher dicots	Asteraceae	*Acmella grandiflora var. brachyglossa*			C		2/1
plants	higher dicots	Asteraceae	*Pterocaulon serrulatum var. serrulatum*			C		1/1

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plants	higher dicots	Asteraceae	*Pluchea dentex*	bowl daisy		C		1/1
plants	higher dicots	Asteraceae	*Rutidosis leucantha*			C		1/1
plants	higher dicots	Asteraceae	*Emilia sonchifolia*		Y			1
plants	higher dicots	Asteraceae	*Epaltes australis*	spreading nutheads		C		1
plants	higher dicots	Asteraceae	*Camptacra barbata*			C		2/2
plants	higher dicots	Asteraceae	*Aster subulatus*	wild aster	Y			2
plants	higher dicots	Asteraceae	*Pluchea xanthina*			C		1/1
plants	higher dicots	Byttneriaceae	*Keraudrenia nephrosperma*			C		1/1
plants	higher dicots	Byttneriaceae	*Keraudrenia hookeriana*			C		1/1
plants	higher dicots	Byttneriaceae	*Keraudrenia collina*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Labichea rupestris*			C		1/1
plants	higher dicots	Campanulaceae	*Isotoma sp. (Myross R.J.Fensham 3883)*			C		3/1
plants	higher dicots	Capparaceae	*Capparis lasiantha*	nipan		C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea spirostylis subsp. compacta*			C		1/1
plants	higher dicots	Chenopodiaceae	*Dysphania plantaginella*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena everistiana*			C		2/2
plants	higher dicots	Chenopodiaceae	*Sclerolaena anisacanthoides*	yellow burr		C		2/2
plants	higher dicots	Chenopodiaceae	*Einadia trigonos subsp. stellulata*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena bicornis var. bicornis*			C		1/1
plants	higher dicots	Chenopodiaceae	*Dysphania melanocarpa forma melanocarpa*			C		1/1
plants	higher dicots	Chenopodiaceae	*Dissocarpus sp. (Doongmabulla E.J.Thompson+ GAL21)*			C		2/2
plants	higher dicots	Chenopodiaceae	*Atriplex sp. (Doongmabulla Homestead E.J.Thompson+ GAL20)*			C		1/1
plants	higher dicots	Chenopodiaceae	*Maireana georgei*			C		2/2
plants	higher dicots	Chenopodiaceae	*Maireana villosa*			C		1/1
plants	higher dicots	Chenopodiaceae	*Atriplex lindleyi*			C		1/1
plants	higher dicots	Chenopodiaceae	*Maireana coronata*			C		2/2
plants	higher dicots	Chenopodiaceae	*Salsola australis*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena glabra*			C		4/4
plants	higher dicots	Chenopodiaceae	*Tecticornia indica*			C		1/1
plants	higher dicots	Chenopodiaceae	*Maireana dichoptera*			C		1/1
plants	higher dicots	Chenopodiaceae	*Rhagodia spinescens*	thorny saltbush		C		2/2
plants	higher dicots	Chenopodiaceae	*Sclerolaena bicornis*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena ramulosa*			C		5/5
plants	higher dicots	Chenopodiaceae	*Dissocarpus paradoxus*	cannonball burr		C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena calcarata*	red burr		C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena convexula*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena diacantha*	grey copper burr		C		5/5
plants	higher dicots	Chenopodiaceae	*Sclerolaena tricuspis*	giant red burr		C		2/2
plants	higher dicots	Chenopodiaceae	*Sclerolaena lanicuspis*			C		2/2
plants	higher dicots	Clusiaceae	*Hypericum gramineum*			C		1/1
plants	higher dicots	Convolvulaceae	*Jacquemontia sp. (Fairview R.W.Johnson 4026)*			C		1/1
plants	higher dicots	Convolvulaceae	*Bonamia media var. media*			C		1/1
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides*			C		2/2
plants	higher dicots	Convolvulaceae	*Polymeria marginata*			C		1/1
plants	higher dicots	Convolvulaceae	*Polymeria calycina*	pink bindweed		C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Euphorbiaceae	*Euphorbia papillata var. laevicaulis*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia coghlanii*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia petala*			C		1/1
plants	higher dicots	Euphorbiaceae	*Beyeria viscosa*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia thelephora var. thelephora*			C		1/1
plants	higher dicots	Fabaceae	*Vigna luteola*	dalrymple vigna	Y			3/1
plants	higher dicots	Fabaceae	*Cullen cinereum*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia juncea*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia supina*			C		1/1
plants	higher dicots	Fabaceae	*Zornia adenophora*			C		1/1
plants	higher dicots	Fabaceae	*Glycine tomentella*	woolly glycine		C		1/1
plants	higher dicots	Fabaceae	*Indigofera colutea*	sticky indigo		C		1/1
plants	higher dicots	Fabaceae	*Indigofera linnaei*	Birdsville indigo		C		1/1
plants	higher dicots	Fabaceae	*Sesbania cannabina*			C		1
plants	higher dicots	Fabaceae	*Aeschynomene indica*	budda pea		C		2/2
plants	higher dicots	Fabaceae	*Indigofera linifolia*			C		1/1
plants	higher dicots	Fabaceae	*Indigofera pratensis*			C		1/1
plants	higher dicots	Fabaceae	*Jacksonia ramosissima*			C		1/1
plants	higher dicots	Fabaceae	*Jacksonia rhadinoclona*	Miles dogwood		C		2/2
plants	higher dicots	Fabaceae	*Leptosema oxylobioides*			C		1/1
plants	higher dicots	Fabaceae	*Vigna vexillata var. angustifolia*			C		2/1
plants	higher dicots	Fabaceae	*Cajanus scarabaeoides var. scarabaeoides*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia sp. (Lake Buchanan E.J.Thompson+ BUC2128)*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia expansa*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia grandiflora*			C		1/1
plants	higher dicots	Goodeniaceae	*Velleia macrocalyx*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia rosulata*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia gracilis*			C		1/1
plants	higher dicots	Haloragaceae	*Myriophyllum artesium*			E		4/1
plants	higher dicots	Lamiaceae	*Plectranthus intraterraneus*			C		1/1
plants	higher dicots	Lamiaceae	*Prostanthera parvifolia*			C		1/1
plants	higher dicots	Lamiaceae	*Teucrium integrifolium*			C		1/1
plants	higher dicots	Lamiaceae	*Ocimum africanum*			C		1/1
plants	higher dicots	Lentibulariaceae	*Utricularia dichotoma*	fairy aprons		C		1
plants	higher dicots	Lentibulariaceae	*Utricularia fenshamii*			C		3/3
plants	higher dicots	Lentibulariaceae	*Utricularia gibba*	floating bladderwort		C		3/2
plants	higher dicots	Lentibulariaceae	*Utricularia caerulea*	blue bladderwort		C		5/2
plants	higher dicots	Loranthaceae	*Lysiana subfalcata*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema bifurcata*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema quandang var. quandang*			C		1/1
plants	higher dicots	Loranthaceae	*Dendrophthoe glabrescens*			C		2/1
plants	higher dicots	Lythraceae	*Ammannia multiflora*	jerry-jerry		C		1/1
plants	higher dicots	Malvaceae	*Sida spinosa*	spiny sida	Y			2/2
plants	higher dicots	Malvaceae	*Sida brachypoda*			C		2/2
plants	higher dicots	Malvaceae	*Sida goniocarpa*			C		1/1
plants	higher dicots	Malvaceae	*Sida trichopoda*			C		1/1

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plants	higher dicots	Malvaceae	*Sida atherophora*			C		1/1
plants	higher dicots	Malvaceae	*Sida sp. (Charters Towers E.J.THompson+ CHA456)*			C		1/1
plants	higher dicots	Malvaceae	*Abutilon calliphyllum*	velvet lanternflower		C		1/1
plants	higher dicots	Malvaceae	*Sida aprica var. solanacea*			C		1/1
plants	higher dicots	Malvaceae	*Abutilon fraseri subsp. fraseri*			C		1/1
plants	higher dicots	Malvaceae	*Sida sp. (Laglan Station L.S.Smith 10325)*			C		1/1
plants	higher dicots	Malvaceae	*Sida sp. (Musselbrook M.B.Thomas+ MRS437)*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus verdcourtii*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia sericophylla*			C		1/1
plants	higher dicots	Mimosaceae	*Neptunia dimorphantha*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia leptostachya*	Townsville wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia stipuligera*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia holosericea*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia tenuissima*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia platycarpa*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia hyaloneura*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia flavescens*	toothed wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia galioides*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia salicina*	doolan		C		2/2
plants	higher dicots	Mimosaceae	*Acacia oswaldii*	miljee		C		1/1
plants	higher dicots	Mimosaceae	*Acacia cambagei*	gidgee		C		2/2
plants	higher dicots	Mimosaceae	*Acacia decora*	pretty wattle		C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca leucadendra*	broad-leaved tea-tree		C		4/1
plants	higher dicots	Myrtaceae	*Corymbia plena*			C		2/2
plants	higher dicots	Myrtaceae	*Thryptomene parviflora*			C		2/2
plants	higher dicots	Myrtaceae	*Leptospermum lamellatum*			C		1/1
plants	higher dicots	Myrtaceae	*Lithomyrtus microphylla*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus camaldulensis*			C		2
plants	higher dicots	Myrtaceae	*Eucalyptus drepanophylla*			C		7/7
plants	higher dicots	Myrtaceae	*Eucalyptus melanophloia - E.whitei*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia setosa subsp. pedicellaris*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus camaldulensis subsp. acuta*			C		2/2
plants	higher dicots	Myrtaceae	*Corymbia aparrerinja - C.dallachiana (Benth.)*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca fluviatilis*			C		2/1
plants	higher dicots	Myrtaceae	*Eucalyptus thozetiana*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus persistens*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus cambageana*	Dawson gum		C		2/2
plants	higher dicots	Myrtaceae	*Corymbia leichhardtii*	rustyjacket		C		1/1
plants	higher dicots	Myrtaceae	*Corymbia lamprophylla*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia clarksoniana*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus coolabah*	coolabah		C		1/1
plants	higher dicots	Myrtaceae	*Corymbia terminalis*			C		2/2
plants	higher dicots	Myrtaceae	*Melaleuca uncinata*			C		2/2
plants	higher dicots	Myrtaceae	*Calytrix microcoma*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca nervosa*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus whitei*	White's ironbark		C		1/1

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plants	higher dicots	Myrtaceae	*Melaleuca tamariscina*			C		1/1
plants	higher dicots	Nyctaginaceae	*Boerhavia dominii*			C		1/1
plants	higher dicots	Nyctaginaceae	*Boerhavia pubescens*			C		1/1
plants	higher dicots	Nyctaginaceae	*Boerhavia paludosa*			C		1/1
plants	higher dicots	Onagraceae	*Ludwigia peploides*		Y			1
plants	higher dicots	Onagraceae	*Ludwigia octovalvis*	willow primrose		C		2
plants	higher dicots	Orobanchaceae	*Buchnera linearis*			C		1/1
plants	higher dicots	Orobanchaceae	*Buchnera ramosissima*			C		2/2
plants	higher dicots	Pentapetaceae	*Melhania oblongifolia*			C		2/2
plants	higher dicots	Phyllanthaceae	*Poranthera microphylla*	small poranthera		C		1/1
plants	higher dicots	Phyllanthaceae	*Phyllanthus sp. (Pentland R.J.Cumming 9742)*			C		1/1
plants	higher dicots	Phyllanthaceae	*Phyllanthus virgatus*			C		2/2
plants	higher dicots	Plantaginaceae	*Scoparia dulcis*	Scoparia	Y			1/1
plants	higher dicots	Polygalaceae	*Polygala crassitesta*			C		1/1
plants	higher dicots	Polygalaceae	*Polygala difficilis*			C		1/1
plants	higher dicots	Polygalaceae	*Polygala linariifolia*			C		1/1
plants	higher dicots	Polygonaceae	*Persicaria decipiens*	slender knotweed		C		3/1
plants	higher dicots	Portulacaceae	*Calandrinia ptychosperma*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea parallela*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea sessilis*			C		1/1
plants	higher dicots	Proteaceae	*Persoonia falcata*			C		1/1
plants	higher dicots	Proteaceae	*Hakea leucoptera*			C		3/3
plants	higher dicots	Proteaceae	*Grevillea pteridifolia*	golden parrot tree		C		1/1
plants	higher dicots	Rhamnaceae	*Alphitonia excelsa*	soap tree		C		1/1
plants	higher dicots	Rubiaceae	*Psydrax forsteri*			C		1/1
plants	higher dicots	Rubiaceae	*Spermacoce brachystema*			C		3/3
plants	higher dicots	Rubiaceae	*Psydrax saligna forma saligna*			C		1/1
plants	higher dicots	Rubiaceae	*Psydrax attenuata forma megalantha*			C		1/1
plants	higher dicots	Rutaceae	*Geijera salicifolia*	brush wilga		C		1/1
plants	higher dicots	Santalaceae	*Santalum lanceolatum*			C		2/2
plants	higher dicots	Sapindaceae	*Atalaya hemiglauca*			C		1/1
plants	higher dicots	Sapindaceae	*Dodonaea lanceolata var. subsessilifolia*			C		1/1
plants	higher dicots	Sapindaceae	*Dodonaea tenuifolia*			C		1/1
plants	higher dicots	Solanaceae	*Solanum esuriale*	quena		C		1/1
plants	higher dicots	Solanaceae	*Solanum crebrispinum*			C		1/1
plants	higher dicots	Solanaceae	*Solanum cleistogamum*			C		1/1
plants	higher dicots	Solanaceae	*Solanum nodiflorum*		Y			1/1
plants	higher dicots	Stackhousiaceae	*Stackhousia intermedia*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium velleioides*			C		1
plants	higher dicots	Violaceae	*Hybanthus enneaspermus*			C		1/1
plants	lower dicots	Nymphaeaceae	*Nymphaea gigantea*			C		3/1
plants	monocots	Amaryllidaceae	*Calostemma luteum*			C		1/1
plants	monocots	Arecaceae	*Livistona lanuginosa*			V	V	2/2
plants	monocots	Cyperaceae	*Cyperus flavidus*			C		3/1
plants	monocots	Cyperaceae	*Eleocharis plana*	ribbed spikerush		C		2/1
plants	monocots	Cyperaceae	*Fuirena ciliaris*			C		2/1

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plants	monocots	Cyperaceae	*Baumea rubiginosa*	soft twigrush		C		4/2
plants	monocots	Cyperaceae	*Cyperus concinnus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus difformis*	rice sedge		C		7/3
plants	monocots	Cyperaceae	*Cyperus exaltatus*	tall flatsedge		C		1
plants	monocots	Cyperaceae	*Fimbristylis rara*			C		2/2
plants	monocots	Cyperaceae	*Fuirena umbellata*			C		2
plants	monocots	Cyperaceae	*Cyperus dactylotes*			C		3/3
plants	monocots	Cyperaceae	*Cyperus laevigatus*			C		5/2
plants	monocots	Cyperaceae	*Scleria sphacelata*			C		1/1
plants	monocots	Cyperaceae	*Cyperus polystachyos*			C		4
plants	monocots	Cyperaceae	*Cyperus victoriensis*			C		3/1
plants	monocots	Cyperaceae	*Cyperus alterniflorus*			C		1/1
plants	monocots	Cyperaceae	*Eleocharis equisetina*			C		5/2
plants	monocots	Cyperaceae	*Schoenoplectus laevis*			C		1/1
plants	monocots	Cyperaceae	*Cyperus sanguinolentus*			C		6/1
plants	monocots	Cyperaceae	*Fimbristylis dichotoma*	common fringe-rush		C		10/5
plants	monocots	Cyperaceae	*Schoenoplectus erectus*		Y			1/1
plants	monocots	Cyperaceae	*Schoenoplectus validus*			C		1
plants	monocots	Cyperaceae	*Fimbristylis littoralis*			C		3/2
plants	monocots	Cyperaceae	*Fimbristylis squarrulosa*			C		2/2
plants	monocots	Cyperaceae	*Schoenoplectus mucronatus*			C		2
plants	monocots	Cyperaceae	*Eleocharis cylindrostachys*			C		1
plants	monocots	Cyperaceae	*Schoenoplectus dissachanthus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus betchei subsp. betchei*			C		3/3
plants	monocots	Cyperaceae	*Schoenoplectus tabernaemontani*			C		2/2
plants	monocots	Cyperaceae	*Cyperus haspan*			C		1
plants	monocots	Cyperaceae	*Cyperus conicus*			C		1/1
plants	monocots	Cyperaceae	*Schoenus kennyi*			C		1/1
plants	monocots	Cyperaceae	*Cyperus iria*			C		1/1
plants	monocots	Eriocaulaceae	*Eriocaulon carsonii subsp. orientale*			E	E	3/3
plants	monocots	Eriocaulaceae	*Eriocaulon carsonii*			E	E	3
plants	monocots	Johnsoniaceae	*Tricoryne elatior*	yellow autumn lily		C		1/1
plants	monocots	Juncaceae	*Juncus usitatus*			C		1/1
plants	monocots	Juncaceae	*Juncus polyanthemus*			C		4/1
plants	monocots	Juncaginaceae	*Cycnogeton multifructus*			C		1/1
plants	monocots	Orchidaceae	*Cymbidium canaliculatum*			C		1/1
plants	monocots	Philydraceae	*Philydrum lanuginosum*	frogsmouth		C		1
plants	monocots	Poaceae	*Enteropogon ramosus*			C		1/1
plants	monocots	Poaceae	*Eragrostis elongata*			C		3/3
plants	monocots	Poaceae	*Imperata cylindrica*	blady grass		C		1
plants	monocots	Poaceae	*Paspalidium distans*	shotgrass		C		1/1
plants	monocots	Poaceae	*Paspalidium gracile*	slender panic		C		2/2
plants	monocots	Poaceae	*Echinochloa inundata*	marsh millet		C		1/1
plants	monocots	Poaceae	*Enneapogon avenaceus*			C		2/2
plants	monocots	Poaceae	*Enneapogon truncatus*			C		1/1
plants	monocots	Poaceae	*Eragrostis lacunaria*	purple lovegrass		C		1/1

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plants	monocots	Poaceae	*Sporobolus scabridus*			C		3/3
plants	monocots	Poaceae	*Triodia microstachya*			C		1/1
plants	monocots	Poaceae	*Tripogon loliiformis*	five minute grass		C		1/1
plants	monocots	Poaceae	*Alloteropsis cimicina*			C		1/1
plants	monocots	Poaceae	*Aristida helicophylla*			C		1/1
plants	monocots	Poaceae	*Cenchrus purpurascens*			C		4/3
plants	monocots	Poaceae	*Cymbopogon bombycinus*	silky oilgrass		C		1/1
plants	monocots	Poaceae	*Dichanthium annulatum*	sheda grass	Y			1/1
plants	monocots	Poaceae	*Digitaria breviglumis*			C		1/1
plants	monocots	Poaceae	*Eragrostis leptocarpa*	drooping lovegrass		C		1/1
plants	monocots	Poaceae	*Perotis rara*	comet grass		C		1/1
plants	monocots	Poaceae	*Eulalia aurea*	silky browntop		C		1/1
plants	monocots	Poaceae	*Melinis repens*	red natal grass	Y			1/1
plants	monocots	Poaceae	*Chloris inflata*	purpletop chloris	Y			3/3
plants	monocots	Poaceae	*Chloris virgata*	feathertop rhodes grass	Y			1/1
plants	monocots	Poaceae	*Diplachne fusca*		Y			5
plants	monocots	Poaceae	*Eriachne obtusa*			C		1/1
plants	monocots	Poaceae	*Isachne globosa*	swamp millet		C		4/3
plants	monocots	Poaceae	*Sehima nervosum*			C		1/1
plants	monocots	Poaceae	*Setaria surgens*			C		1/1
plants	monocots	Poaceae	*Triodia pungens*			C		1/1
plants	monocots	Poaceae	*Cynodon dactylon*		Y			3
plants	monocots	Poaceae	*Leersia hexandra*	swamp rice grass		C		5/2
plants	monocots	Poaceae	*Themeda avenacea*			C		1/1
plants	monocots	Poaceae	*Aristida calycina*			C		1/1
plants	monocots	Poaceae	*Aristida pruinosa*			C		3/3
plants	monocots	Poaceae	*Chloris pectinata*	comb chloris		C		2/2
plants	monocots	Poaceae	*Digitaria brownii*			C		1/1
plants	monocots	Poaceae	*Eragrostis pilosa*	soft lovegrass	Y			1/1
plants	monocots	Poaceae	*Panicum laevinode*	pepper grass		C		1/1
plants	monocots	Poaceae	*Paspalidium rarum*			C		1/1
plants	monocots	Poaceae	*Sporobolus caroli*	fairy grass		C		1/1
plants	monocots	Poaceae	*Triodia longiceps*	giant grey spinifex		C		2/2
plants	monocots	Poaceae	*Aristida latifolia*	feathertop wiregrass		C		1/1
plants	monocots	Poaceae	*Astrebla elymoides*	hoop mitchell grass		C		1/1
plants	monocots	Poaceae	*Astrebla pectinata*	barley mitchell grass		C		1/1
plants	monocots	Poaceae	*Astrebla squarrosa*	bull mitchell grass		C		1/1
plants	monocots	Poaceae	*Cenchrus setigerus*		Y			1/1
plants	monocots	Poaceae	*Chrysopogon fallax*			C		1/1
plants	monocots	Poaceae	*Digitaria bicornis*			C		1/1
plants	monocots	Poaceae	*Digitaria ciliaris*	summer grass	Y			1/1
plants	monocots	Poaceae	*Echinochloa colona*	awnless barnyard grass	Y			2/1
plants	monocots	Poaceae	*Eragrostis falcata*	sickle lovegrass		C		1/1
plants	monocots	Poaceae	*Eragrostis sororia*			C		3/2
plants	monocots	Poaceae	*Ischaemum australe*			C		2
plants	monocots	Poaceae	*Paspalum dilatatum*	paspalum	Y			2

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plants	monocots	Poaceae	*Paspalum distichum*	water couch		C		1
plants	monocots	Poaceae	*Paspalum vaginatum*	saltwater couch		C		2/1
plants	monocots	Poaceae	*Sacciolepis indica*	Indian cupscale grass		C		7/2
plants	monocots	Poaceae	*Sporobolus pamelae*			E		5/1
plants	monocots	Poaceae	*Amphipogon sericeus*			C		1/1
plants	monocots	Poaceae	*Brachyachne tenella*			C		2/2
plants	monocots	Poaceae	*Chrysopogon filipes*			C		1/1
plants	monocots	Poaceae	*Cymbopogon ambiguus*	lemon grass		C		1/1
plants	monocots	Poaceae	*Enneapogon gracilis*	slender nineawn		C		3/3
plants	monocots	Poaceae	*Eragrostis parviflora*	weeping lovegrass		C		1/1
plants	monocots	Poaceae	*Iseilema vaginiflorum*	red flinders grass		C		1/1
plants	monocots	Poaceae	*Sporobolus disjunctus*			C		4/4
plants	monocots	Poaceae	*Sporobolus virginicus*	sand couch		C		3/1
plants	monocots	Poaceae	*Alloteropsis semialata*	cockatoo grass		C		1/1
plants	monocots	Poaceae	*Echinochloa crus-galli*	barnyard grass	Y			4/1
plants	monocots	Poaceae	*Enneapogon lindleyanus*			C		1/1
plants	monocots	Poaceae	*Enneapogon polyphyllus*	leafy nineawn		C		1/1
plants	monocots	Poaceae	*Enteropogon acicularis*	curly windmill grass		C		1/1
plants	monocots	Poaceae	*Urochloa mosambicensis*	sabi grass	Y			1/1
plants	monocots	Poaceae	*Eragrostis spartinoides*			C		1/1
plants	monocots	Poaceae	*Paspalidium constrictum*			C		1/1
plants	monocots	Poaceae	*Pseudoraphis spinescens*	spiny mudgrass		C		1/1
plants	monocots	Poaceae	*Sporobolus actinocladus*	katoora grass		C		3/3
plants	monocots	Poaceae	*Sporobolus partimpatens*			NT		1/1
plants	monocots	Poaceae	*Enneapogon robustissimus*			C		1/1
plants	monocots	Poaceae	*Hymenachne amplexicaulis*	hymenachne	Y			1
plants	monocots	Poaceae	*Paspalidium albovillosum*			C		1/1
plants	monocots	Poaceae	*Sporobolus australasicus*			C		1/1
plants	monocots	Poaceae	*Digitaria divaricatissima*	spreading umbrella grass		C		2/2
plants	monocots	Poaceae	*Diplachne fusca var. fusca*			C		4/4
plants	monocots	Poaceae	*Eriochloa pseudoacrotricha*			C		4/4
plants	monocots	Poaceae	*Cynodon dactylon var. dactylon*		Y			1/1
plants	monocots	Poaceae	*Aristida calycina var. calycina*			C		1/1
plants	monocots	Poaceae	*Aristida calycina var. praealta*			C		1/1
plants	monocots	Poaceae	*Dinebra decipiens var. decipiens*			C		1/1
plants	monocots	Poaceae	*Ischaemum australe var. australe*			C		1/1
plants	monocots	Poaceae	*Ischaemum australe var. villosum*			C		1/1
plants	monocots	Poaceae	*Aristida benthamii var. benthamii*			C		1/1
plants	monocots	Poaceae	*Aristida holathera var. holathera*			C		1/1
plants	monocots	Poaceae	*Chloris divaricata var. divaricata*	slender chloris		C		2/2
plants	monocots	Poaceae	*Hymenachne amplexicaulis cv. Olive*		Y			1/1
plants	monocots	Poaceae	*Amphipogon caricinus var. caricinus*			C		1/1
plants	monocots	Poaceae	*Bothriochloa bladhii subsp. bladhii*			C		1/1
plants	monocots	Poaceae	*Dichanthium sericeum subsp. sericeum*			C		1/1
plants	monocots	Poaceae	*Chloris sp. (Edgbaston R.J.Fensham 5694)*			C		1/1
plants	monocots	Poaceae	*Bothriochloa decipiens var. cloncurrensis*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Eriachne mucronata forma (Burnham R.W.Purdie 1370)*			C		1/1
plants	monocots	Potamogetonaceae	*Potamogeton tricarinatus*	floating pondweed		C		2/1
plants	monocots	Typhaceae	*Typha domingensis*			C		1/1
plants	monocots	Typhaceae	*Typha orientalis*	broad-leaved cumbungi		C		1
plants		Phrymaceae	*Peplidium foecundum*			C		2/1
plants		Phrymaceae	*Peplidium*			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -21.746586
Longitude: 146.176
Distance: 25
Email: cannandale@hansenbailey.com.au
Date submitted: Thursday 04 Sep 2014 11:09:45
Date extracted: Thursday 04 Sep 2014 11:10:14

The number of records retrieved = 477

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			5
animals	amphibians	Hylidae	*Litoria inermis*	bumpy rocketfrog		C		3
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		4
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		5
animals	amphibians	Hylidae	*Cyclorana novaehollandiae*	eastern snapping frog		C		4
animals	amphibians	Hylidae	*Litoria rothii*	northern laughing treefrog		C		3
animals	amphibians	Hylidae	*Cyclorana brevipes*	superb collared frog		C		2
animals	amphibians	Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		C		2
animals	amphibians	Myobatrachidae	*Crinia deserticola*	chirping froglet		C		1
animals	birds	Acanthizidae	*Gerygone fusca*	western gerygone		C		2
animals	birds	Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		C		2
animals	birds	Acanthizidae	*Gerygone albogularis*	white-throated gerygone		C		8
animals	birds	Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		C		12
animals	birds	Acanthizidae	*Acanthiza uropygialis*	chestnut-rumped thornbill		C		2
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		22
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		2
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		1
animals	birds	Accipitridae	*Lophoictinia isura*	square-tailed kite		NT		2
animals	birds	Accipitridae	*Milvus migrans*	black kite		C		2
animals	birds	Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		C		48
animals	birds	Anatidae	*Aythya australis*	hardhead		C		2
animals	birds	Anatidae	*Malacorhynchus membranaceus*	pink-eared duck		C		2
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		2
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		4
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		2
animals	birds	Artamidae	*Artamus personatus*	masked woodswallow		C		2
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		37
animals	birds	Artamidae	*Artamus minor*	little woodswallow		C		5
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		2
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		22
animals	birds	Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		C		2
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		8
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		49
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		2
animals	birds	Cacatuidae	*Nymphicus hollandicus*	cockatiel		C		2
animals	birds	Cacatuidae	*Eolophus roseicapillus*	galah		C		2
animals	birds	Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		C		6
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		18
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		28
animals	birds	Campephagidae	*Coracina maxima*	ground cuckoo-shrike		C		2
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		C		4
animals	birds	Campephagidae	*Lalage sueurii*	white-winged triller		C		8
animals	birds	Casuariidae	*Dromaius novaehollandiae*	emu		C		3
animals	birds	Charadriidae	*Elseyornis melanops*	black-fronted dotterel		C		2
animals	birds	Charadriidae	*Vanellus miles novaehollandiae*	masked lapwing (southern subspecies)		C		2
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Climacteridae	*Climacteris picumnus*	brown treecreeper		C		13
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	17
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		12
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		13
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		23
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		20
animals	birds	Corvidae	*Corvus coronoides*	Australian raven		C		16
animals	birds	Cuculidae	*Cacomantis variolosus*	brush cuckoo		C		2
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		6
animals	birds	Cuculidae	*Cacomantis pallidus*	pallid cuckoo		C		2
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		4
animals	birds	Estrildidae	*Poephila cincta cincta*	black-throated finch (white-rumped subspecies)		E	E	25
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		5
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		6
animals	birds	Eurostopodidae	*Eurostopodus argus*	spotted nightjar		C		14
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		14
animals	birds	Falconidae	*Falco cenchroides*	Nankeen kestrel		C		6
animals	birds	Gruidae	*Grus rubicunda*	brolga		C		2
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		2
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		10
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		12
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		7
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		2
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		4
animals	birds	Maluridae	*Malurus lamberti*	variegated fairy-wren		C		22
animals	birds	Megaluridae	*Eremiornis carteri*	spinifexbird		C		4
animals	birds	Megaluridae	*Cincloramphus mathewsi*	rufous songlark		C		4
animals	birds	Meliphagidae	*Gavicalis virescens*	singing honeyeater		C		19
animals	birds	Meliphagidae	*Manorina flavigula*	yellow-throated miner		C		29
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		47
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		15
animals	birds	Meliphagidae	*Ptilotula penicillatus*	white-plumed honeyeater		C		11
animals	birds	Meliphagidae	*Acanthagenys rufogularis*	spiny-cheeked honeyeater		C		19
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		2
animals	birds	Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		C		18
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		12
animals	birds	Meliphagidae	*Ptilotula plumulus*	grey-fronted honeyeater		C		10
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		7
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		SL		10
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		14
animals	birds	Monarchidae	*Myiagra inquieta*	restless flycatcher		C		10
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		16
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		6
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		8
animals	birds	Otididae	*Ardeotis australis*	Australian bustard		C		2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Pachycephalidae	*Oreoica gutturalis*	crested bellbird		C		29
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		24
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		30
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		30
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		38
animals	birds	Petroicidae	*Melanodryas cucullata*	hooded robin		C		4
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		2
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		19
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		2
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		16
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		14
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		10
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		14
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus maculatus*	spotted bowerbird		C		4
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		29
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		6
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		20
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		1
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis		C		1
animals	birds	Threskiornithidae	*Platalea regia*	royal spoonbill		C		1
animals	birds	Turnicidae	*Turnix varius*	painted button-quail		C		4
animals	mammals	Canidae	*Canis lupus dingo*	dingo				1
animals	mammals	Dasyuridae	*Sminthopsis macroura*	stripe-faced dunnart		C		11
animals	mammals	Emballonuridae	*Saccolaimus flaviventris*	yellow-bellied sheathtail bat		C		1
animals	mammals	Felidae	*Felis catus*	cat	Y			3
animals	mammals	Leporidae	*Oryctolagus cuniculus*	rabbit	Y			2
animals	mammals	Macropodidae	*Macropus giganteus*	eastern grey kangaroo		C		14
animals	mammals	Macropodidae	*Macropus rufus*	red kangaroo		C		15
animals	mammals	Macropodidae	*Macropus robustus*	common wallaroo		C		6
animals	mammals	Macropodidae	*Lagorchestes conspicillatus*	spectacled hare-wallaby		C		1
animals	mammals	Molossidae	*Chaerephon jobensis*	northern freetail bat		C		1
animals	mammals	Muridae	*Leggadina lakedownensis*	Lakeland Downs mouse		C		1
animals	mammals	Muridae	*Pseudomys delicatulus*	delicate mouse		C		4
animals	mammals	Muridae	*Pseudomys patrius*	eastern pebble-mound mouse		C		1
animals	mammals	Muridae	*Mus musculus*	house mouse	Y			1
animals	mammals	Muridae	*Pseudomys desertor*	desert mouse		C		11
animals	mammals	Petauridae	*Petaurus breviceps*	sugar glider		C		2
animals	mammals	Petauridae	*Petaurus norfolcensis*	squirrel glider		C		1
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		4
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		SL	V	2
animals	mammals	Potoroidae	*Aepyprymnus rufescens*	rufous bettong		C		1
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox		C		1
animals	mammals	Suidae	*Sus scrofa*	pig	Y			1
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		SL		3
animals	mammals	Vespertilionidae	*Chalinolobus morio*	chocolate wattled bat		C		1
animals	mammals	Vespertilionidae	*Vespadelus baverstocki*	inland forest bat		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	mammals	Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat		C		1
animals	mammals	Vespertilionidae	*Vespadelus finlaysoni*	Finlayson's cave bat		C		1
animals	mammals	Vespertilionidae	*Nyctophilus geoffroyi*	lesser long-eared bat		C		3
animals	mammals	Vespertilionidae	*Scotorepens greyii*	little broad-nosed bat		C		5
animals	mammals	Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat		C		3
animals	mammals	Vespertilionidae	*Chalinolobus picatus*	little pied bat		NT		1
animals	reptiles	Agamidae	*Amphibolurus gilberti*	Gilbert's dragon		C		1
animals	reptiles	Agamidae	*Diporiphora australis*			C		3
animals	reptiles	Agamidae	*Chlamydosaurus kingii*	frilled lizard		C		1
animals	reptiles	Agamidae	*Pogona barbata*	bearded dragon		C		12
animals	reptiles	Agamidae	*Diporiphora nobbi*	nobbi		C		2
animals	reptiles	Agamidae	*Ctenophorus nuchalis*	central netted dragon		C		7
animals	reptiles	Boidae	*Aspidites melanocephalus*	black-headed python		C		3
animals	reptiles	Carphodactylidae	*Nephrurus asper*	spiny knob-tailed gecko		C		2
animals	reptiles	Colubridae	*Boiga irregularis*	brown tree snake		C		1
animals	reptiles	Diplodactylidae	*Rhynchoedura ornata sensu lato*	beaked gecko		C		2
animals	reptiles	Diplodactylidae	*Diplodactylus conspicillatus*	fat-tailed diplodactylus		C		4
animals	reptiles	Diplodactylidae	*Lucasium steindachneri*	Steindachner's gecko		C		8
animals	reptiles	Diplodactylidae	*Strophurus williamsi*	soft-spined gecko		C		4
animals	reptiles	Diplodactylidae	*Amalosia rhombifer*	zig-zag gecko		C		1
animals	reptiles	Diplodactylidae	*Oedura marmorata*	marbled velvet gecko		C		1
animals	reptiles	Elapidae	*Pseudonaja guttata*	speckled brown snake		C		1
animals	reptiles	Elapidae	*Acanthophis praelongus*	northern death adder		C		1
animals	reptiles	Elapidae	*Cryptophis boschmai*	Carpentaria whip snake		C		1
animals	reptiles	Elapidae	*Furina diadema*	red-naped snake		C		1
animals	reptiles	Elapidae	*Demansia psammophis*	yellow-faced whip snake		C		1
animals	reptiles	Gekkonidae	*Gehyra dubia*			C		2
animals	reptiles	Gekkonidae	*Gehyra versicolor*			C		1
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		C		15
animals	reptiles	Gekkonidae	*Gehyra catenata*			C		2
animals	reptiles	Pygopodidae	*Pygopus schraderi*	eastern hooded scaly-foot		C		1
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard		C		1
animals	reptiles	Scincidae	*Lerista punctatovittata*			C		3
animals	reptiles	Scincidae	*Cryptoblepharus plagiocephalus sensu lato*			C		7
animals	reptiles	Scincidae	*Morethia taeniopleura*	fire-tailed skink		C		2
animals	reptiles	Scincidae	*Proablepharus tenuis*			C		1
animals	reptiles	Scincidae	*Ctenotus pantherinus*			C		5
animals	reptiles	Scincidae	*Morethia boulengeri*			C		3
animals	reptiles	Scincidae	*Tiliqua scincoides*	eastern blue-tongued lizard		C		1
animals	reptiles	Scincidae	*Ctenotus strauchii*			C		5
animals	reptiles	Scincidae	*Ctenotus spaldingi*			C		5
animals	reptiles	Scincidae	*Concinnia sokosoma*	stout bar-sided skink		C		1
animals	reptiles	Scincidae	*Egernia striolata*	tree skink		C		5
animals	reptiles	Scincidae	*Ctenotus hebetior*			C		7
animals	reptiles	Scincidae	*Ctenotus ingrami*			C		4
animals	reptiles	Scincidae	*Carlia schmeltzii*			C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	reptiles	Scincidae	*Carlia munda*			C		10
animals	reptiles	Scincidae	*Menetia maini*			C		2
animals	reptiles	Scincidae	*Menetia greyii*			C		8
animals	reptiles	Typhlopidae	*Ramphotyphlops ligatus*			C		1
animals	reptiles	Varanidae	*Varanus tristis*	black-tailed monitor		C		5
animals	reptiles	Varanidae	*Varanus gouldii*	sand monitor		C		1
plants	higher dicots	Acanthaceae	*Dipteracanthus australasicus subsp. australasicus*			C		2/2
plants	higher dicots	Acanthaceae	*Rostellularia adscendens*			C		1/1
plants	higher dicots	Amaranthaceae	*Ptilotus nobilis subsp. semilanatus*			C		1/1
plants	higher dicots	Apiaceae	*Eryngium plantagineum*	long eryngium		C		1/1
plants	higher dicots	Apocynaceae	*Carissa ovata*	currantbush		C		1
plants	higher dicots	Asteraceae	*Pluchea dentex*	bowl daisy		C		1/1
plants	higher dicots	Asteraceae	*Pluchea xanthina*			C		1/1
plants	higher dicots	Asteraceae	*Camptacra barbata*			C		2/2
plants	higher dicots	Asteraceae	*Minuria integerrima*	smooth minuria		C		1/1
plants	higher dicots	Asteraceae	*Streptoglossa odora*			C		1/1
plants	higher dicots	Asteraceae	*Pterocaulon redolens*			C		1/1
plants	higher dicots	Asteraceae	*Calotis xanthosioidea*			C		1/1
plants	higher dicots	Asteraceae	*Vittadinia pterochaeta*	rough fuzzweed		C		1/1
plants	higher dicots	Asteraceae	*Pterocaulon intermedium*			C		1/1
plants	higher dicots	Asteraceae	*Parthenium hysterophorus*	parthenium weed	Y			1/1
plants	higher dicots	Asteraceae	*Streptoglossa adscendens*	desert daisy		C		2/2
plants	higher dicots	Asteraceae	*Chrysocephalum apiculatum*	yellow buttons		C		2/2
plants	higher dicots	Asteraceae	*Olearia arguta var. lanata*			C		1/1
plants	higher dicots	Asteraceae	*Apowollastonia spilanthoides*			C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium peninsulare*			C		1/1
plants	higher dicots	Byttneriaceae	*Keraudrenia hookeriana*			C		1/1
plants	higher dicots	Byttneriaceae	*Keraudrenia nephrosperma*			C		1/1
plants	higher dicots	Byttneriaceae	*Keraudrenia collina*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Labichea rupestris*			C		2/2
plants	higher dicots	Caesalpiniaceae	*Senna artemisioides subsp. sturtii*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Senna artemisioides subsp. zygophylla*			C		1/1
plants	higher dicots	Campanulaceae	*Wahlenbergia gracilis*	sprawling bluebell		C		1/1
plants	higher dicots	Capparaceae	*Capparis lasiantha*	nipan		C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea corymbosa*			C		1/1
plants	higher dicots	Chenopodiaceae	*Maireana villosa*			C		1/1
plants	higher dicots	Chenopodiaceae	*Maireana coronata*			C		1/1
plants	higher dicots	Chenopodiaceae	*Salsola australis*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena glabra*			C		1/1
plants	higher dicots	Chenopodiaceae	*Maireana dichoptera*			C		1/1
plants	higher dicots	Chenopodiaceae	*Einadia trigonos subsp. stellulata*			C		1/1
plants	higher dicots	Chenopodiaceae	*Dysphania melanocarpa forma melanocarpa*			C		1/1
plants	higher dicots	Chenopodiaceae	*Maireana georgei*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena anisacanthoides*	yellow burr		C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena everistiana*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena lanicuspis*			C		2/2

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plants	higher dicots	Chenopodiaceae	*Sclerolaena diacantha*	grey copper burr		C		4/4
plants	higher dicots	Chenopodiaceae	*Sclerolaena ramulosa*			C		2/2
plants	higher dicots	Chenopodiaceae	*Sclerolaena convexula*			C		2/2
plants	higher dicots	Clusiaceae	*Hypericum gramineum*			C		1/1
plants	higher dicots	Convolvulaceae	*Bonamia media var. media*			C		1/1
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides*			C		3/2
plants	higher dicots	Convolvulaceae	*Polymeria marginata*			C		1/1
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides var. decumbens*			C		1/1
plants	higher dicots	Dilleniaceae	*Hibbertia exutiacies*			C		1/1
plants	higher dicots	Erythroxylaceae	*Erythroxylum australe*	cocaine tree		C		1
plants	higher dicots	Euphorbiaceae	*Beyeria viscosa*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia petala*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia stevenii*	bottle tree spurge		C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia coghlanii*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia papillata var. laevicaulis*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia thelephora var. thelephora*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia tannensis subsp. eremophila*			C		3/3
plants	higher dicots	Euphorbiaceae	*Euphorbia mitchelliana var. mitchelliana*			C		2/2
plants	higher dicots	Euphorbiaceae	*Euphorbia*			C		1/1
plants	higher dicots	Euphorbiaceae	*Microstachys chamaelea*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia*			C		1/1
plants	higher dicots	Fabaceae	*Zornia adenophora*			C		2/2
plants	higher dicots	Fabaceae	*Cajanus marmoratus*			C		2/2
plants	higher dicots	Fabaceae	*Glycine tomentella*	woolly glycine		C		3/3
plants	higher dicots	Fabaceae	*Indigofera colutea*	sticky indigo		C		2/2
plants	higher dicots	Fabaceae	*Aeschynomene indica*	budda pea		C		1/1
plants	higher dicots	Fabaceae	*Tephrosia sp. (Lake Buchanan E.J.Thompson+ BUC2128)*			C		2/2
plants	higher dicots	Fabaceae	*Indigofera linifolia*			C		2/2
plants	higher dicots	Fabaceae	*Tephrosia leptoclada*			C		3/3
plants	higher dicots	Fabaceae	*Jacksonia rhadinoclona*	Miles dogwood		C		3/3
plants	higher dicots	Fabaceae	*Leptosema oxylobioides*			C		1/1
plants	higher dicots	Fabaceae	*Swainsona swainsonioides*	downy swainsona		C		1/1
plants	higher dicots	Fabaceae	*Gastrolobium grandiflorum*			C		1/1
plants	higher dicots	Fabaceae	*Desmodium filiforme*			C		2/2
plants	higher dicots	Goodeniaceae	*Dampiera adpressa*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia gracilis*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia grandiflora*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia splendida*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia rosulata*			C		1/1
plants	higher dicots	Lamiaceae	*Ocimum africanum*			C		1/1
plants	higher dicots	Lamiaceae	*Prostanthera parvifolia*			C		1/1
plants	higher dicots	Loganiaceae	*Mitrasacme sp. (Warang M.B.Thomas 1571)*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema quandang var. quandang*			C		1/1
plants	higher dicots	Loranthaceae	*Lysiana subfalcata*			C		1/1
plants	higher dicots	Loranthaceae	*Lysiana spathulata subsp. parvifolia*			C		1/1
plants	higher dicots	Lythraceae	*Ammannia robertsii*			E		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Lythraceae	*Ammannia multiflora*	jerry-jerry		C		1/1
plants	higher dicots	Malvaceae	*Abutilon calliphyllum*	velvet lanternflower		C		1/1
plants	higher dicots	Malvaceae	*Hibiscus leptocladus*			C		1/1
plants	higher dicots	Malvaceae	*Sida sp. (Laglan Station L.S.Smith 10325)*			C		2/2
plants	higher dicots	Malvaceae	*Sida sp. (Musselbrook M.B.Thomas+ MRS437)*			C		1/1
plants	higher dicots	Malvaceae	*Sida sp. (Charters Towers E.J.THompson+ CHA456)*			C		1/1
plants	higher dicots	Malvaceae	*Sida rohlenae subsp. rohlenae*			C		2/2
plants	higher dicots	Malvaceae	*Sida atherophora*			C		1/1
plants	higher dicots	Malvaceae	*Sida trichopoda*			C		1/1
plants	higher dicots	Malvaceae	*Sida goniocarpa*			C		1/1
plants	higher dicots	Malvaceae	*Sida brachypoda*			C		1/1
plants	higher dicots	Malvaceae	*Sida spinosa*	spiny sida	Y			1/1
plants	higher dicots	Malvaceae	*Sida*			C		1
plants	higher dicots	Mimosaceae	*Acacia galioides*			C		3/3
plants	higher dicots	Mimosaceae	*Acacia flavescens*	toothed wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia salicina*	doolan		C		1/1
plants	higher dicots	Mimosaceae	*Acacia oswaldii*	miljee		C		1/1
plants	higher dicots	Mimosaceae	*Acacia cambagei*	gidgee		C		2/2
plants	higher dicots	Mimosaceae	*Acacia decora*	pretty wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia sp. (Urandangi L.Pedley 2025)*			C		1/1
plants	higher dicots	Mimosaceae	*Neptunia dimorphantha*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia sericophylla*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia leptostachya*	Townsville wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia stipuligera*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia holosericea*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia tenuissima*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia platycarpa*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia hyaloneura*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia torulosa*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia dallachiana*			C		1
plants	higher dicots	Myrtaceae	*Melaleuca uncinata*			C		2/2
plants	higher dicots	Myrtaceae	*Calytrix microcoma*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca nervosa*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus whitei*	White's ironbark		C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca pallescens*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus camaldulensis subsp. acuta*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia setosa subsp. pedicellaris*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus melanophloia - E.whitei*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus drepanophylla*			C		6/6
plants	higher dicots	Myrtaceae	*Lithomyrtus microphylla*			C		1/1
plants	higher dicots	Myrtaceae	*Leptospermum lamellatum*			C		1/1
plants	higher dicots	Myrtaceae	*Thryptomene parviflora*			C		2/2
plants	higher dicots	Myrtaceae	*Ochrosperma adpressum*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca tamariscina*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus thozetiana*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus persistens*			C		2/2

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plants	higher dicots	Myrtaceae	*Eucalyptus cambageana*	Dawson gum		C		2/2
plants	higher dicots	Myrtaceae	*Corymbia leichhardtii*	rustyjacket		C		1/1
plants	higher dicots	Myrtaceae	*Corymbia plena*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia clarksoniana*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia lamprophylla*			C		2/1
plants	higher dicots	Nyctaginaceae	*Boerhavia pubescens*			C		1/1
plants	higher dicots	Nyctaginaceae	*Boerhavia paludosa*			C		1/1
plants	higher dicots	Onagraceae	*Ludwigia perennis*			C		1/1
plants	higher dicots	Orobanchaceae	*Buchnera linearis*			C		1/1
plants	higher dicots	Orobanchaceae	*Buchnera ramosissima*			C		2/2
plants	higher dicots	Phyllanthaceae	*Phyllanthus virgatus*			C		4/4
plants	higher dicots	Phyllanthaceae	*Poranthera microphylla*	small poranthera		C		1/1
plants	higher dicots	Picrodendraceae	*Petalostigma pubescens*	quinine tree		C		1
plants	higher dicots	Pittosporaceae	*Bursaria incana*			C		1
plants	higher dicots	Plantaginaceae	*Scoparia dulcis*	Scoparia	Y			1/1
plants	higher dicots	Polygalaceae	*Polygala pycnantha*			NT		1/1
plants	higher dicots	Polygalaceae	*Polygala difficilis*			C		1/1
plants	higher dicots	Polygalaceae	*Polygala crassitesta*			C		1/1
plants	higher dicots	Portulacaceae	*Calandrinia ptychosperma*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca oleracea*	pigweed	Y			1
plants	higher dicots	Proteaceae	*Hakea lorea*			C		1
plants	higher dicots	Proteaceae	*Hakea leucoptera*			C		3/3
plants	higher dicots	Proteaceae	*Persoonia falcata*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea sessilis*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea parallela*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea pteridifolia*	golden parrot tree		C		1/1
plants	higher dicots	Rubiaceae	*Synaptantha tillaeacea var. tillaeacea*			C		1/1
plants	higher dicots	Rubiaceae	*Psydrax attenuata forma megalantha*			C		1/1
plants	higher dicots	Rubiaceae	*Psydrax saligna forma saligna*			C		1/1
plants	higher dicots	Rubiaceae	*Oldenlandia mitrasacmoides*			C		1/1
plants	higher dicots	Rubiaceae	*Spermacoce brachystema*			C		2/2
plants	higher dicots	Rubiaceae	*Psydrax forsteri*			C		1/1
plants	higher dicots	Rubiaceae	*Oldenlandia mitrasacmoides subsp. nigricans*			C		2/2
plants	higher dicots	Santalaceae	*Santalum lanceolatum*			C		2/2
plants	higher dicots	Sapindaceae	*Atalaya hemiglauca*			C		2/2
plants	higher dicots	Sapindaceae	*Dodonaea tenuifolia*			C		1/1
plants	higher dicots	Scrophulariaceae	*Eremophila maculata subsp. maculata*			C		2/2
plants	higher dicots	Solanaceae	*Solanum esuriale*	quena		C		1/1
plants	higher dicots	Solanaceae	*Solanum cleistogamum*			C		1/1
plants	higher dicots	Solanaceae	*Solanum nodiflorum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum crebrispinum*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Grewia latifolia*	dysentery plant		C		1
plants	higher dicots	Sparrmanniaceae	*Grewia retusifolia*			C		1/1
plants	higher dicots	Stackhousiaceae	*Stackhousia intermedia*			C		2/2
plants	higher dicots	Stylidiaceae	*Stylidium eglandulosum*			C		1/1
plants	higher dicots	Violaceae	*Hybanthus enneaspermus*			C		1/1

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plants	higher dicots	Violaceae	*Hybanthus monopetalus*			C		1
plants	higher dicots	Violaceae	*Hybanthus stellarioides*			C		1/1
plants	higher dicots	Zygophyllaceae	*Tribulopis angustifolia*			C		1/1
plants	lower dicots	Aristolochiaceae	*Aristolochia*			C		1
plants	monocots	Commelinaceae	*Cyanotis axillaris*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis macrantha*			C		1/1
plants	monocots	Cyperaceae	*Cyperus bifax*	western nutgrass		C		1/1
plants	monocots	Cyperaceae	*Cyperus conicus*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis neilsonii*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus erectus*		Y			2/2
plants	monocots	Cyperaceae	*Eleocharis atropurpurea*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis caespitosa*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis littoralis*			C		2/2
plants	monocots	Cyperaceae	*Fimbristylis microcarya*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis squarrulosa*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus lateriflorus*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus dissachanthus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus betchei subsp. betchei*			C		1/1
plants	monocots	Cyperaceae	*Cyperus iria*			C		3/3
plants	monocots	Cyperaceae	*Fimbristylis*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis dichotoma*	common fringe-rush		C		2/2
plants	monocots	Cyperaceae	*Schoenoplectus laevis*			C		2/2
plants	monocots	Cyperaceae	*Scleria tricuspidata*			C		1/1
plants	monocots	Cyperaceae	*Schoenus kennyi*			C		1/1
plants	monocots	Cyperaceae	*Cyperus gracilis*			C		1
plants	monocots	Cyperaceae	*Cyperus concinnus*			C		2/2
plants	monocots	Cyperaceae	*Cyperus difformis*	rice sedge		C		1/1
plants	monocots	Cyperaceae	*Cyperus flaccidus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus dactylotes*			C		2/2
plants	monocots	Cyperaceae	*Cyperus pulchellus*			C		1/1
plants	monocots	Cyperaceae	*Scleria sphacelata*			C		1/1
plants	monocots	Cyperaceae	*Bulbostylis barbata*			C		1/1
plants	monocots	Cyperaceae	*Cyperus orgadophilus*			C		1/1
plants	monocots	Juncaginaceae	*Cycnogeton dubius*			C		1/1
plants	monocots	Laxmanniaceae	*Lomandra leucocephala subsp. leucocephala*			C		3/3
plants	monocots	Laxmanniaceae	*Thysanotus chinensis*			C		1/1
plants	monocots	Laxmanniaceae	*Laxmannia gracilis*	slender wire lily		C		2/2
plants	monocots	Poaceae	*Setaria surgens*			C		1/1
plants	monocots	Poaceae	*Triodia pungens*			C		1/1
plants	monocots	Poaceae	*Aristida ingrata*			C		2/2
plants	monocots	Poaceae	*Eriachne ciliata*			C		1/1
plants	monocots	Poaceae	*Chloris pectinata*	comb chloris		C		1/1
plants	monocots	Poaceae	*Digitaria brownii*			C		1/1
plants	monocots	Poaceae	*Elionurus citreus*	lemon-scented grass		C		1/1
plants	monocots	Poaceae	*Eragrostis pilosa*	soft lovegrass	Y			1/1
plants	monocots	Poaceae	*Panicum laevinode*	pepper grass		C		1/1

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plants	monocots	Poaceae	*Paspalidium rarum*			C		3/2
plants	monocots	Poaceae	*Urochloa piligera*			C		1/1
plants	monocots	Poaceae	*Aristida latifolia*	feathertop wiregrass		C		1/1
plants	monocots	Poaceae	*Astrebla pectinata*	barley mitchell grass		C		1/1
plants	monocots	Poaceae	*Chrysopogon fallax*			C		1
plants	monocots	Poaceae	*Digitaria ciliaris*	summer grass	Y			1/1
plants	monocots	Poaceae	*Eriachne aristidea*			C		1/1
plants	monocots	Poaceae	*Amphipogon sericeus*			C		2/2
plants	monocots	Poaceae	*Aristida sciuroides*			C		2/2
plants	monocots	Poaceae	*Brachyachne tenella*			C		3/3
plants	monocots	Poaceae	*Cymbopogon ambiguus*	lemon grass		C		1/1
plants	monocots	Poaceae	*Enneapogon gracilis*	slender nineawn		C		2/2
plants	monocots	Poaceae	*Eragrostis cumingii*			C		1/1
plants	monocots	Poaceae	*Eragrostis elongata*			C		2/2
plants	monocots	Poaceae	*Paspalidium distans*	shotgrass		C		1/1
plants	monocots	Poaceae	*Digitaria longiflora*			C		1/1
plants	monocots	Poaceae	*Enneapogon avenaceus*			C		2/2
plants	monocots	Poaceae	*Enneapogon truncatus*			C		1/1
plants	monocots	Poaceae	*Eragrostis lacunaria*	purple lovegrass		C		1/1
plants	monocots	Poaceae	*Sporobolus scabridus*			C		2/2
plants	monocots	Poaceae	*Triodia microstachya*			C		1/1
plants	monocots	Poaceae	*Whiteochloa airoides*			C		1/1
plants	monocots	Poaceae	*Alloteropsis cimicina*			C		1/1
plants	monocots	Poaceae	*Aristida helicophylla*			C		2/2
plants	monocots	Poaceae	*Aristida hygrometrica*			C		3/3
plants	monocots	Poaceae	*Digitaria breviglumis*			C		2/2
plants	monocots	Poaceae	*Eragrostis filicaulis*			C		2/2
plants	monocots	Poaceae	*Eragrostis lanicaulis*			C		1/1
plants	monocots	Poaceae	*Eragrostis leptocarpa*	drooping lovegrass		C		1/1
plants	monocots	Poaceae	*Eragrostis parviflora*	weeping lovegrass		C		1/1
plants	monocots	Poaceae	*Iseilema membranaceum*	small flinders grass		C		1/1
plants	monocots	Poaceae	*Schizachyrium fragile*	firegrass		C		1/1
plants	monocots	Poaceae	*Sporobolus disjunctus*			C		1/1
plants	monocots	Poaceae	*Alloteropsis semialata*	cockatoo grass		C		2/2
plants	monocots	Poaceae	*Enneapogon lindleyanus*			C		1/1
plants	monocots	Poaceae	*Enneapogon polyphyllus*	leafy nineawn		C		1/1
plants	monocots	Poaceae	*Urochloa mosambicensis*	sabi grass	Y			1/1
plants	monocots	Poaceae	*Urochloa subquadripara*		Y			1/1
plants	monocots	Poaceae	*Eragrostis spartinoides*			C		1/1
plants	monocots	Poaceae	*Sporobolus actinocladus*	katoora grass		C		3/3
plants	monocots	Poaceae	*Enneapogon robustissimus*			C		3/3
plants	monocots	Poaceae	*Paspalidium albovillosum*			C		1/1
plants	monocots	Poaceae	*Digitaria divaricatissima*	spreading umbrella grass		C		1/1
plants	monocots	Poaceae	*Eriochloa pseudoacrotricha*			C		1/1
plants	monocots	Poaceae	*Dactyloctenium buchananensis*			C		1/1
plants	monocots	Poaceae	*Aristida calycina var. praealta*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Dinebra decipiens var. decipiens*			C		1/1
plants	monocots	Poaceae	*Aristida holathera var. holathera*			C		4/4
plants	monocots	Poaceae	*Chloris divaricata var. divaricata*	slender chloris		C		1/1
plants	monocots	Poaceae	*Amphipogon caricinus var. caricinus*			C		1/1
plants	monocots	Poaceae	*Urochloa holosericea subsp. velutina*			C		1/1
plants	monocots	Poaceae	*Aristida*			C		1
plants	monocots	Poaceae	*Eriachne*			C		1
plants	monocots	Poaceae	*Enneapogon*			C		1
plants	monocots	Poaceae	*Eragrostis*			C		1
plants	monocots	Poaceae	*Perotis rara*	comet grass		C		1/1
plants	monocots	Poaceae	*Melinis repens*	red natal grass	Y			1/1
plants	monocots	Poaceae	*Sarga plumosum*			C		2/2
plants	monocots	Poaceae	*Chloris virgata*	feathertop rhodes grass	Y			1/1
plants	monocots	Poaceae	*Eriachne obtusa*			C		1/1
plants	monocots	Poaceae	*Panicum effusum*			C		2/2
plants	monocots	Xanthorrhoeaceae	*Xanthorrhoea johnsonii*			C		1/1
plants		Phrymaceae	*Peplidium foecundum*			C		1/1
plants		Streptophyceae	*Lamprothamnium papulosum*			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -21.613032
Longitude: 146.1178
Distance: 25
Email: cannandale@hansenbailey.com.au
Date submitted: Thursday 04 Sep 2014 11:29:08
Date extracted: Thursday 04 Sep 2014 11:30:03

The number of records retrieved = 517

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			5
animals	amphibians	Hylidae	*Litoria inermis*	bumpy rocketfrog		C		3
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		3
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		3
animals	amphibians	Hylidae	*Cyclorana brevipes*	superb collared frog		C		1
animals	amphibians	Hylidae	*Litoria rothii*	northern laughing treefrog		C		3
animals	amphibians	Hylidae	*Cyclorana novaehollandiae*	eastern snapping frog		C		3
animals	amphibians	Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		C		3
animals	amphibians	Limnodynastidae	*Limnodynastes convexiusculus*	marbled frog		C		1
animals	amphibians	Myobatrachidae	*Crinia deserticola*	chirping froglet		C		1
animals	amphibians	Myobatrachidae	*Uperoleia littlejohni*	Einasleigh gungan		C		1
animals	birds	Acanthizidae	*Gerygone fusca*	western gerygone		C		2
animals	birds	Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		C		2
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		14
animals	birds	Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		C		12
animals	birds	Acanthizidae	*Acanthiza uropygialis*	chestnut-rumped thornbill		C		2
animals	birds	Acanthizidae	*Gerygone albogularis*	white-throated gerygone		C		2
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk		C		4
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		5
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		7
animals	birds	Accipitridae	*Milvus migrans*	black kite		C		4
animals	birds	Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		C		46
animals	birds	Anatidae	*Cygnus atratus*	black swan		C		5
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		9
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		3
animals	birds	Anatidae	*Dendrocygna eytoni*	plumed whistling-duck		C		3
animals	birds	Anatidae	*Anas rhynchotis*	Australasian shoveler		C		1
animals	birds	Anatidae	*Stictonetta naevosa*	freckled duck		NT		2
animals	birds	Anhingidae	*Anhinga novaehollandiae*	Australasian darter		C		2
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		9
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		5
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		3
animals	birds	Artamidae	*Artamus minor*	little woodswallow		C		7
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		11
animals	birds	Artamidae	*Artamus personatus*	masked woodswallow		C		2
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		50
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		59
animals	birds	Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		C		4
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		30
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		2
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		5
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		25
animals	birds	Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		C		6
animals	birds	Cacatuidae	*Eolophus roseicapillus*	galah		C		20
animals	birds	Cacatuidae	*Nymphicus hollandicus*	cockatiel		C		11
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		18

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Campephagidae	*Coracina maxima*	ground cuckoo-shrike		C		5
animals	birds	Casuariidae	*Dromaius novaehollandiae*	emu		C		7
animals	birds	Charadriidae	*Elseyornis melanops*	black-fronted dotterel		C		5
animals	birds	Charadriidae	*Vanellus miles novaehollandiae*	masked lapwing (southern subspecies)		C		3
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		4
animals	birds	Charadriidae	*Charadrius ruficapillus*	red-capped plover		C		2
animals	birds	Climacteridae	*Climacteris picumnus*	brown treecreeper		C		11
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		7
animals	birds	Columbidae	*Geopelia cuneata*	diamond dove		C		5
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		22
animals	birds	Columbidae	*Phaps chalcoptera*	common bronzewing		C		7
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	17
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		17
animals	birds	Corvidae	*Corvus coronoides*	Australian raven		C		17
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		23
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		6
animals	birds	Cuculidae	*Cacomantis pallidus*	pallid cuckoo		C		2
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		2
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		9
animals	birds	Estrildidae	*Poephila cincta cincta*	black-throated finch (white-rumped subspecies)		E	E	6
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		2
animals	birds	Eurostopodidae	*Eurostopodus argus*	spotted nightjar		C		20
animals	birds	Falconidae	*Falco cenchroides*	Nankeen kestrel		C		12
animals	birds	Falconidae	*Falco longipennis*	Australian hobby		C		2
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		17
animals	birds	Gruidae	*Grus rubicunda*	brolga		C		4
animals	birds	Halcyonidae	*Todiramphus pyrrhopygius*	red-backed kingfisher		C		5
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		2
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		4
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		5
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		6
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		5
animals	birds	Hirundinidae	*Petrochelidon ariel*	fairy martin		C		1
animals	birds	Laridae	*Gelochelidon nilotica*	gull-billed tern		C		4
animals	birds	Laridae	*Hydroprogne caspia*	Caspian tern		SL		2
animals	birds	Laridae	*Chlidonias hybrida*	whiskered tern		C		3
animals	birds	Laridae	*Chroicocephalus novaehollandiae*	silver gull		C		4
animals	birds	Maluridae	*Malurus lamberti*	variegated fairy-wren		C		16
animals	birds	Megaluridae	*Cincloramphus mathewsi*	rufous songlark		C		7
animals	birds	Meliphagidae	*Manorina flavigula*	yellow-throated miner		C		47
animals	birds	Meliphagidae	*Ptilotula plumulus*	grey-fronted honeyeater		C		11
animals	birds	Meliphagidae	*Gavicalis virescens*	singing honeyeater		C		22
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		6
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		28
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		11

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Meliphagidae	*Ptilotula penicillatus*	white-plumed honeyeater		C		12
animals	birds	Meliphagidae	*Acanthagenys rufogularis*	spiny-cheeked honeyeater		C		6
animals	birds	Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		C		8
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		2
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		SL		8
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		29
animals	birds	Monarchidae	*Myiagra inquieta*	restless flycatcher		C		4
animals	birds	Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		C		3
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		13
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		2
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		2
animals	birds	Otididae	*Ardeotis australis*	Australian bustard		C		6
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		20
animals	birds	Pachycephalidae	*Oreoica gutturalis*	crested bellbird		C		30
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		27
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		38
animals	birds	Pelecanidae	*Pelecanus conspicillatus*	Australian pelican		C		4
animals	birds	Petroicidae	*Melanodryas cucullata*	hooded robin		C		4
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		30
animals	birds	Phalacrocoracidae	*Phalacrocorax carbo*	great cormorant		C		1
animals	birds	Phalacrocoracidae	*Phalacrocorax sulcirostris*	little black cormorant		C		2
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		2
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		17
animals	birds	Podicipedidae	*Podiceps cristatus*	great crested grebe		C		1
animals	birds	Podicipedidae	*Poliocephalus poliocephalus*	hoary-headed grebe		C		2
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		23
animals	birds	Psittacidae	*Melopsittacus undulatus*	budgerigar		C		2
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		16
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		9
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		21
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus maculatus*	spotted bowerbird		C		2
animals	birds	Rallidae	*Fulica atra*	Eurasian coot		C		1
animals	birds	Recurvirostridae	*Recurvirostra novaehollandiae*	red-necked avocet		C		2
animals	birds	Recurvirostridae	*Himantopus himantopus*	black-winged stilt		C		4
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		35
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		5
animals	birds	Scolopacidae	*Calidris acuminata*	sharp-tailed sandpiper		SL		2
animals	birds	Scolopacidae	*Actitis hypoleucos*	common sandpiper		SL		1
animals	birds	Scolopacidae	*Tringa nebularia*	common greenshank		SL		2
animals	birds	Scolopacidae	*Tringa stagnatilis*	marsh sandpiper		SL		3
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		10
animals	birds	Threskiornithidae	*Plegadis falcinellus*	glossy ibis		SL		3
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis		C		2
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		2
animals	birds	Turnicidae	*Turnix varius*	painted button-quail		C		7
animals	birds	Tytonidae	*Tyto javanica*	eastern barn owl		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	mammals	Dasyuridae	*Sminthopsis macroura*	stripe-faced dunnart		C		9
animals	mammals	Emballonuridae	*Saccolaimus flaviventris*	yellow-bellied sheathtail bat		C		2
animals	mammals	Felidae	*Felis catus*	cat	Y			2
animals	mammals	Macropodidae	*Lagorchestes conspicillatus*	spectacled hare-wallaby		C		1
animals	mammals	Macropodidae	*Macropus rufus*	red kangaroo		C		18
animals	mammals	Macropodidae	*Macropus robustus*	common wallaroo		C		6
animals	mammals	Macropodidae	*Macropus giganteus*	eastern grey kangaroo		C		10
animals	mammals	Molossidae	*Chaerephon jobensis*	northern freetail bat		C		2
animals	mammals	Muridae	*Pseudomys desertor*	desert mouse		C		7
animals	mammals	Muridae	*Pseudomys patrius*	eastern pebble-mound mouse		C		1
animals	mammals	Muridae	*Pseudomys delicatulus*	delicate mouse		C		4
animals	mammals	Petauridae	*Petaurus breviceps*	sugar glider		C		2
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		1
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		SL	V	1
animals	mammals	Potoroidae	*Aepyprymnus rufescens*	rufous bettong		C		1
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox		C		2
animals	mammals	Suidae	*Sus scrofa*	pig	Y			3
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		SL		3
animals	mammals	Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat		C		1
animals	mammals	Vespertilionidae	*Vespadelus baverstocki*	inland forest bat		C		1
animals	mammals	Vespertilionidae	*Vespadelus finlaysoni*	Finlayson's cave bat		C		1
animals	mammals	Vespertilionidae	*Nyctophilus geoffroyi*	lesser long-eared bat		C		3
animals	mammals	Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat		C		2
animals	mammals	Vespertilionidae	*Scotorepens greyii*	little broad-nosed bat		C		4
animals	mammals	Vespertilionidae	*Chalinolobus morio*	chocolate wattled bat		C		1
animals	mammals	Vespertilionidae	*Chalinolobus picatus*	little pied bat		NT		1
animals	reptiles	Agamidae	*Pogona barbata*	bearded dragon		C		13
animals	reptiles	Agamidae	*Diporiphora nobbi*	nobbi		C		4
animals	reptiles	Agamidae	*Ctenophorus nuchalis*	central netted dragon		C		8
animals	reptiles	Agamidae	*Chlamydosaurus kingii*	frilled lizard		C		1
animals	reptiles	Agamidae	*Diporiphora australis*			C		4
animals	reptiles	Boidae	*Aspidites melanocephalus*	black-headed python		C		3
animals	reptiles	Carphodactylidae	*Nephrurus asper*	spiny knob-tailed gecko		C		2
animals	reptiles	Chelidae	*Chelodina longicollis*	eastern snake-necked turtle		C		1
animals	reptiles	Diplodactylidae	*Diplodactylus conspicillatus*	fat-tailed diplodactylus		C		3
animals	reptiles	Diplodactylidae	*Strophurus williamsi*	soft-spined gecko		C		4
animals	reptiles	Diplodactylidae	*Lucasium steindachneri*	Steindachner's gecko		C		3
animals	reptiles	Diplodactylidae	*Amalosia rhombifer*	zig-zag gecko		C		1
animals	reptiles	Diplodactylidae	*Oedura marmorata*	marbled velvet gecko		C		2
animals	reptiles	Elapidae	*Acanthophis praelongus*	northern death adder		C		1
animals	reptiles	Elapidae	*Pseudonaja nuchalis sensu lato*	western brown snake		C		1
animals	reptiles	Elapidae	*Pseudonaja guttata*	speckled brown snake		C		1
animals	reptiles	Elapidae	*Demansia psammophis*	yellow-faced whip snake		C		1
animals	reptiles	Gekkonidae	*Gehyra dubia*			C		4
animals	reptiles	Gekkonidae	*Gehyra versicolor*			C		2
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		C		13

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	reptiles	Gekkonidae	*Gehyra catenata*			C		3
animals	reptiles	Pygopodidae	*Pygopus schraderi*	eastern hooded scaly-foot		C		1
animals	reptiles	Scincidae	*Tiliqua scincoides*	eastern blue-tongued lizard		C		2
animals	reptiles	Scincidae	*Ctenotus pantherinus*			C		4
animals	reptiles	Scincidae	*Proablepharus tenuis*			C		1
animals	reptiles	Scincidae	*Morethia taeniopleura*	fire-tailed skink		C		1
animals	reptiles	Scincidae	*Lerista punctatovittata*			C		4
animals	reptiles	Scincidae	*Cryptoblepharus pannosus*	ragged snake-eyed skink		C		1
animals	reptiles	Scincidae	*Cryptoblepharus plagiocephalus sensu lato*			C		6
animals	reptiles	Scincidae	*Ctenotus strauchii*			C		1
animals	reptiles	Scincidae	*Ctenotus spaldingi*			C		4
animals	reptiles	Scincidae	*Concinnia sokosoma*	stout bar-sided skink		C		1
animals	reptiles	Scincidae	*Egernia striolata*	tree skink		C		3
animals	reptiles	Scincidae	*Ctenotus hebetior*			C		12
animals	reptiles	Scincidae	*Carlia schmeltzii*			C		1
animals	reptiles	Scincidae	*Ctenotus ingrami*			C		3
animals	reptiles	Scincidae	*Menetia greyii*			C		12
animals	reptiles	Scincidae	*Carlia munda*			C		6
animals	reptiles	Scincidae	*Menetia maini*			C		2
animals	reptiles	Typhlopidae	*Ramphotyphlops ligatus*			C		1
animals	reptiles	Varanidae	*Varanus tristis*	black-tailed monitor		C		7
animals	reptiles	Varanidae	*Varanus gouldii*	sand monitor		C		3
plants	ferns	Marsileaceae	*Marsilea mutica*	shiny nardoo		C		1/1
plants	higher dicots	Acanthaceae	*Dipteracanthus australasicus subsp. australasicus*			C		2/2
plants	higher dicots	Acanthaceae	*Rostellularia adscendens*			C		1/1
plants	higher dicots	Aizoaceae	*Trianthema triquetra*	red spinach		C		1/1
plants	higher dicots	Amaranthaceae	*Nyssanthes erecta*			C		1/1
plants	higher dicots	Amaranthaceae	*Alternanthera angustifolia*			C		1/1
plants	higher dicots	Amaranthaceae	*Amaranthus interruptus*			C		1/1
plants	higher dicots	Amaranthaceae	*Alternanthera pungens*	khaki weed	Y			1/1
plants	higher dicots	Apiaceae	*Eryngium plantagineum*	long eryngium		C		1/1
plants	higher dicots	Apocynaceae	*Marsdenia viridiflora subsp. viridiflora*			C		1/1
plants	higher dicots	Apocynaceae	*Marsdenia microlepis*			C		1/1
plants	higher dicots	Apocynaceae	*Carissa ovata*	currantbush		C		1
plants	higher dicots	Asteraceae	*Blumea diffusa*			C		1/1
plants	higher dicots	Asteraceae	*Pluchea dentex*	bowl daisy		C		1/1
plants	higher dicots	Asteraceae	*Pluchea xanthina*			C		1/1
plants	higher dicots	Asteraceae	*Camptacra barbata*			C		1/1
plants	higher dicots	Asteraceae	*Peripleura scabra*			NT		1/1
plants	higher dicots	Asteraceae	*Peripleura diffusa*			C		1/1
plants	higher dicots	Asteraceae	*Minuria integerrima*	smooth minuria		C		1/1
plants	higher dicots	Asteraceae	*Pluchea rubelliflora*			C		1/1
plants	higher dicots	Asteraceae	*Pterocaulon redolens*			C		1/1
plants	higher dicots	Asteraceae	*Calotis xanthosioidea*			C		1/1
plants	higher dicots	Asteraceae	*Vittadinia pterochaeta*	rough fuzzweed		C		1/1
plants	higher dicots	Asteraceae	*Pterocaulon intermedium*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Asteraceae	*Streptoglossa adscendens*	desert daisy		C		2/2
plants	higher dicots	Asteraceae	*Chrysocephalum apiculatum*	yellow buttons		C		1/1
plants	higher dicots	Asteraceae	*Apowollastonia spilanthoides*			C		1/1
plants	higher dicots	Asteraceae	*Calotis sp. (Lake Buchanan J.Kemp+ 3384H)*			C		1/1
plants	higher dicots	Boraginaceae	*Ehretia membranifolia*	weeping koda		C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium ovalifolium*			C		2/2
plants	higher dicots	Boraginaceae	*Heliotropium peninsulare*			C		1/1
plants	higher dicots	Byttneriaceae	*Keraudrenia hookeriana*			C		1/1
plants	higher dicots	Byttneriaceae	*Keraudrenia collina*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Senna artemisioides subsp. sturtii*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Labichea rupestris*			C		2/2
plants	higher dicots	Caesalpiniaceae	*Senna artemisioides subsp. zygophylla*			C		1/1
plants	higher dicots	Campanulaceae	*Wahlenbergia tumidifructa*			C		1/1
plants	higher dicots	Campanulaceae	*Wahlenbergia gracilis*	sprawling bluebell		C		1/1
plants	higher dicots	Capparaceae	*Capparis lasiantha*	nipan		C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea corymbosa*			C		2/2
plants	higher dicots	Chenopodiaceae	*Dysphania melanocarpa forma melanocarpa*			C		1/1
plants	higher dicots	Chenopodiaceae	*Dysphania plantaginella*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena anisacanthoides*	yellow burr		C		2/2
plants	higher dicots	Chenopodiaceae	*Sclerolaena bicornis var. horrida*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena diacantha*	grey copper burr		C		2/2
plants	higher dicots	Chenopodiaceae	*Sclerolaena convexula*			C		2/2
plants	higher dicots	Chenopodiaceae	*Sclerolaena ramulosa*			C		1/1
plants	higher dicots	Chenopodiaceae	*Maireana villosa*			C		1/1
plants	higher dicots	Clusiaceae	*Hypericum gramineum*			C		1/1
plants	higher dicots	Convolvulaceae	*Bonamia media*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea brassii*			C		2/2
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides*			C		4/3
plants	higher dicots	Convolvulaceae	*Bonamia media var. media*			C		1/1
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides var. decumbens*			C		1/1
plants	higher dicots	Dilleniaceae	*Hibbertia exutiacies*			C		1/1
plants	higher dicots	Erythroxylaceae	*Erythroxylum australe*	cocaine tree		C		1
plants	higher dicots	Euphorbiaceae	*Beyeria viscosa*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia mitchelliana var. mitchelliana*			C		2/2
plants	higher dicots	Euphorbiaceae	*Euphorbia stevenii*	bottle tree spurge		C		1/1
plants	higher dicots	Euphorbiaceae	*Microstachys chamaelea*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia tannensis subsp. eremophila*			C		3/3
plants	higher dicots	Euphorbiaceae	*Euphorbia*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia petala*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia sp. (Lake Buchanan E.J.Thompson+ BUC2128)*			C		2/2
plants	higher dicots	Fabaceae	*Zornia adenophora*			C		2/2
plants	higher dicots	Fabaceae	*Cajanus marmoratus*			C		2/2
plants	higher dicots	Fabaceae	*Glycine tomentella*	woolly glycine		C		3/3
plants	higher dicots	Fabaceae	*Indigofera colutea*	sticky indigo		C		3/3
plants	higher dicots	Fabaceae	*Indigofera linnaei*	Birdsville indigo		C		1/1

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plants	higher dicots	Fabaceae	*Desmodium filiforme*			C		3/3
plants	higher dicots	Fabaceae	*Indigofera linifolia*			C		3/3
plants	higher dicots	Fabaceae	*Tephrosia leptoclada*			C		3/3
plants	higher dicots	Fabaceae	*Jacksonia ramosissima*			C		2/2
plants	higher dicots	Fabaceae	*Indigofera haplophylla*			C		2/2
plants	higher dicots	Fabaceae	*Jacksonia rhadinoclona*	Miles dogwood		C		1/1
plants	higher dicots	Fabaceae	*Swainsona swainsonioides*	downy swainsona		C		1/1
plants	higher dicots	Fabaceae	*Gastrolobium grandiflorum*			C		1/1
plants	higher dicots	Fabaceae	*Crotalaria medicaginea var. neglecta*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia brachyodon var. longifolia*			C		1/1
plants	higher dicots	Fabaceae	*Lotus cruentus*	red-flowered lotus		C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia hirsuta*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia grandiflora*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia splendida*			C		1/1
plants	higher dicots	Goodeniaceae	*Dampiera adpressa*			C		1/1
plants	higher dicots	Lamiaceae	*Prostanthera parvifolia*			C		1/1
plants	higher dicots	Loganiaceae	*Mitrasacme sp. (Warang M.B.Thomas 1571)*			C		2/2
plants	higher dicots	Loranthaceae	*Lysiana spathulata subsp. parvifolia*			C		1/1
plants	higher dicots	Lythraceae	*Ammannia robertsii*			E		1/1
plants	higher dicots	Malvaceae	*Sida*			C		1
plants	higher dicots	Malvaceae	*Sida macropoda*			C		1/1
plants	higher dicots	Malvaceae	*Sida brachypoda*			C		1/1
plants	higher dicots	Malvaceae	*Sida fibulifera*			C		2/2
plants	higher dicots	Malvaceae	*Sida goniocarpa*			C		1/1
plants	higher dicots	Malvaceae	*Sida sp. (Musselbrook M.B.Thomas+ MRS437)*			C		1/1
plants	higher dicots	Malvaceae	*Sida everistiana*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus leptocladus*			C		1/1
plants	higher dicots	Malvaceae	*Lawrencia buchananensis*			V	V	1/1
plants	higher dicots	Malvaceae	*Sida rohlenae subsp. rohlenae*			C		2/2
plants	higher dicots	Malvaceae	*Sida sp. (Laglan Station L.S.Smith 10325)*			C		1/1
plants	higher dicots	Malvaceae	*Sida atherophora*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia decora*	pretty wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia cambagei*	gidgee		C		1/1
plants	higher dicots	Mimosaceae	*Acacia salicina*	doolan		C		3/3
plants	higher dicots	Mimosaceae	*Acacia torulosa*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia galioides*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia lazaridis*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia flavescens*	toothed wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia hyaloneura*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia ixiophylla*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia platycarpa*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia tenuissima*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia holosericea*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia stipuligera*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia leptostachya*	Townsville wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia sericophylla*			C		1/1

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plants	higher dicots	Mimosaceae	*Vachellia bidwillii*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia aneura var. aneura*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia sp. (Urandangi L.Pedley 2025)*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus persistens*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus thozetiana*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca tamariscina*			C		2/2
plants	higher dicots	Myrtaceae	*Ochrosperma adpressum*			C		1/1
plants	higher dicots	Myrtaceae	*Thryptomene parviflora*			C		1/1
plants	higher dicots	Myrtaceae	*Leptospermum lamellatum*			C		1/1
plants	higher dicots	Myrtaceae	*Lithomyrtus microphylla*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus drepanophylla*			C		5/5
plants	higher dicots	Myrtaceae	*Corymbia brachycarpa x C.plena*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus melanophloia - E.whitei*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus camaldulensis subsp. acuta*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus melanophloia subsp. melanophloia*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus sp. (Mt Hope Homestead E.J.Thompson+ BUC175)*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia plena*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca nervosa*			C		1/1
plants	higher dicots	Myrtaceae	*Calytrix microcoma*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus similis*	Queensland yellowjacket		C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca uncinata*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus coolabah*	coolabah		C		1/1
plants	higher dicots	Myrtaceae	*Corymbia dallachiana*			C		1
plants	higher dicots	Myrtaceae	*Corymbia clarksoniana*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia lamprophylla*			C		2/1
plants	higher dicots	Myrtaceae	*Corymbia leichhardtii*	rustyjacket		C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus cambageana*	Dawson gum		C		2/2
plants	higher dicots	Onagraceae	*Ludwigia perennis*			C		1/1
plants	higher dicots	Orobanchaceae	*Buchnera linearis*			C		2/2
plants	higher dicots	Phyllanthaceae	*Phyllanthus virgatus*			C		3/3
plants	higher dicots	Phyllanthaceae	*Sauropus elachophyllus var. elachophyllus*			C		1/1
plants	higher dicots	Picrodendraceae	*Petalostigma pubescens*	quinine tree		C		1
plants	higher dicots	Picrodendraceae	*Petalostigma banksii*			C		2/2
plants	higher dicots	Pittosporaceae	*Bursaria incana*			C		1
plants	higher dicots	Plantaginaceae	*Scoparia dulcis*	Scoparia	Y			2/2
plants	higher dicots	Polygalaceae	*Polygala pycnantha*			NT		2/2
plants	higher dicots	Portulacaceae	*Calandrinia ptychosperma*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca oligosperma*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca tuberosa*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca oleracea*	pigweed	Y			1
plants	higher dicots	Proteaceae	*Grevillea parallela*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea decora subsp. decora*			C		3/3
plants	higher dicots	Proteaceae	*Grevillea sessilis*			C		1/1
plants	higher dicots	Proteaceae	*Persoonia falcata*			C		1/1
plants	higher dicots	Proteaceae	*Hakea lorea*			C		1

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plants	higher dicots	Rhamnaceae	*Alphitonia excelsa*	soap tree		C		1/1
plants	higher dicots	Rubiaceae	*Oldenlandia mitrasacmoides subsp. nigricans*			C		2/2
plants	higher dicots	Rubiaceae	*Everistia vacciniifolia forma crassa*			C		1/1
plants	higher dicots	Rubiaceae	*Spermacoce brachystema*			C		2/2
plants	higher dicots	Rubiaceae	*Synaptantha tillaeacea var. tillaeacea*			C		1/1
plants	higher dicots	Rubiaceae	*Oldenlandia mitrasacmoides*			C		1/1
plants	higher dicots	Rubiaceae	*Psydrax saligna forma saligna*			C		2/2
plants	higher dicots	Rutaceae	*Flindersia maculosa*	leopardwood		C		1/1
plants	higher dicots	Santalaceae	*Santalum lanceolatum*			C		2/2
plants	higher dicots	Sapindaceae	*Atalaya hemiglauca*			C		2/2
plants	higher dicots	Sapindaceae	*Dodonaea tenuifolia*			C		1/1
plants	higher dicots	Sapindaceae	*Dodonaea filifolia*			C		1/1
plants	higher dicots	Scrophulariaceae	*Eremophila maculata subsp. maculata*			C		2/2
plants	higher dicots	Scrophulariaceae	*Eremophila mitchellii*			C		1/1
plants	higher dicots	Solanaceae	*Solanum nodiflorum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum parvifolium subsp. parvifolium*			C		1/1
plants	higher dicots	Solanaceae	*Solanum esuriale*	quena		C		1/1
plants	higher dicots	Solanaceae	*Solanum cleistogamum*			C		1/1
plants	higher dicots	Solanaceae	*Solanum crebrispinum*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Grewia retusifolia*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Grewia latifolia*	dysentery plant		C		1
plants	higher dicots	Sparrmanniaceae	*Corchorus sidoides subsp. vermicularis*			C		1/1
plants	higher dicots	Stackhousiaceae	*Stackhousia intermedia*			C		2/2
plants	higher dicots	Stylidiaceae	*Stylidium eglandulosum*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium eriorhizum*			C		1/1
plants	higher dicots	Violaceae	*Hybanthus monopetalus*			C		1
plants	higher dicots	Violaceae	*Hybanthus stellarioides*			C		1/1
plants	higher dicots	Violaceae	*Hybanthus enneaspermus*			C		1/1
plants	higher dicots	Zygophyllaceae	*Tribulopis angustifolia*			C		1/1
plants	lower dicots	Aristolochiaceae	*Aristolochia*			C		1
plants	lower dicots	Lauraceae	*Cassytha rufa*			C		1/1
plants	monocots	Commelinaceae	*Cyanotis axillaris*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus laevis*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis neilsonii*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus erectus*		Y			2/2
plants	monocots	Cyperaceae	*Eleocharis atropurpurea*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis caespitosa*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis littoralis*			C		2/2
plants	monocots	Cyperaceae	*Fimbristylis microcarya*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis squarrulosa*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus lateriflorus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus conicus var. conicus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus betchei subsp. betchei*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis sp. (Lake Buchanan V.J.Neldner+ 3362)*			C		2/2
plants	monocots	Cyperaceae	*Fimbristylis dichotoma*	common fringe-rush		C		4/4
plants	monocots	Cyperaceae	*Fimbristylis macrantha*			C		1/1

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plants	monocots	Cyperaceae	*Scleria tricuspidata*			C		1/1
plants	monocots	Cyperaceae	*Cyperus orgadophilus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus holoschoenus*			C		1/1
plants	monocots	Cyperaceae	*Bulbostylis barbata*			C		1/1
plants	monocots	Cyperaceae	*Cyperus squarrosus*	bearded flatsedge		C		1/1
plants	monocots	Cyperaceae	*Cyperus pulchellus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus iria*			C		2/2
plants	monocots	Cyperaceae	*Fimbristylis*			C		1/1
plants	monocots	Cyperaceae	*Cyperus bifax*	western nutgrass		C		2/2
plants	monocots	Cyperaceae	*Cyperus conicus*			C		1/1
plants	monocots	Cyperaceae	*Schoenus kennyi*			C		1/1
plants	monocots	Cyperaceae	*Cyperus bulbosus*			C		2/2
plants	monocots	Cyperaceae	*Cyperus gracilis*			C		1
plants	monocots	Cyperaceae	*Cyperus concinnus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus difformis*	rice sedge		C		1/1
plants	monocots	Cyperaceae	*Cyperus flaccidus*			C		1/1
plants	monocots	Eriocaulaceae	*Eriocaulon cinereum*			C		1/1
plants	monocots	Johnsoniaceae	*Tricoryne elatior*	yellow autumn lily		C		1/1
plants	monocots	Juncaginaceae	*Cycnogeton dubius*			C		1/1
plants	monocots	Laxmanniaceae	*Lomandra leucocephala subsp. leucocephala*			C		3/3
plants	monocots	Laxmanniaceae	*Lomandra multiflora subsp. multiflora*			C		1/1
plants	monocots	Laxmanniaceae	*Thysanotus chinensis*			C		1/1
plants	monocots	Laxmanniaceae	*Laxmannia gracilis*	slender wire lily		C		2/2
plants	monocots	Poaceae	*Setaria surgens*			C		1/1
plants	monocots	Poaceae	*Triodia pungens*			C		1/1
plants	monocots	Poaceae	*Aristida ingrata*			C		2/2
plants	monocots	Poaceae	*Eriachne ciliata*			C		1/1
plants	monocots	Poaceae	*Aristida contorta*	bunched kerosene grass		C		1/1
plants	monocots	Poaceae	*Chloris pectinata*	comb chloris		C		2/2
plants	monocots	Poaceae	*Digitaria brownii*			C		2/2
plants	monocots	Poaceae	*Elionurus citreus*	lemon-scented grass		C		1/1
plants	monocots	Poaceae	*Mnesithea formosa*			C		1/1
plants	monocots	Poaceae	*Panicum laevinode*	pepper grass		C		1/1
plants	monocots	Poaceae	*Paspalidium rarum*			C		3/2
plants	monocots	Poaceae	*Urochloa piligera*			C		1/1
plants	monocots	Poaceae	*Chrysopogon fallax*			C		1
plants	monocots	Poaceae	*Digitaria bicornis*			C		2/2
plants	monocots	Poaceae	*Digitaria ciliaris*	summer grass	Y			1/1
plants	monocots	Poaceae	*Eragrostis sororia*			C		2/2
plants	monocots	Poaceae	*Eriachne aristidea*			C		1/1
plants	monocots	Poaceae	*Amphipogon sericeus*			C		2/2
plants	monocots	Poaceae	*Aristida sciuroides*			C		2/2
plants	monocots	Poaceae	*Brachyachne tenella*			C		2/2
plants	monocots	Poaceae	*Cymbopogon ambiguus*	lemon grass		C		1/1
plants	monocots	Poaceae	*Cymbopogon obtectus*			C		1/1
plants	monocots	Poaceae	*Enneapogon gracilis*	slender nineawn		C		1/1

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plants	monocots	Poaceae	*Eragrostis cumingii*			C		2/2
plants	monocots	Poaceae	*Eragrostis elongata*			C		2/2
plants	monocots	Poaceae	*Eragrostis speciosa*			C		1/1
plants	monocots	Poaceae	*Paspalidium distans*	shotgrass		C		1/1
plants	monocots	Poaceae	*Digitaria longiflora*			C		2/2
plants	monocots	Poaceae	*Eragrostis basedowii*			C		2/2
plants	monocots	Poaceae	*Eragrostis lacunaria*	purple lovegrass		C		1/1
plants	monocots	Poaceae	*Sporobolus scabridus*			C		3/3
plants	monocots	Poaceae	*Thaumastochloa major*			C		1/1
plants	monocots	Poaceae	*Whiteochloa airoides*			C		1/1
plants	monocots	Poaceae	*Alloteropsis cimicina*			C		1/1
plants	monocots	Poaceae	*Aristida helicophylla*			C		1/1
plants	monocots	Poaceae	*Aristida hygrometrica*			C		3/3
plants	monocots	Poaceae	*Digitaria breviglumis*			C		2/2
plants	monocots	Poaceae	*Eragrostis filicaulis*			C		2/2
plants	monocots	Poaceae	*Eragrostis lanicaulis*			C		2/2
plants	monocots	Poaceae	*Eragrostis microcarpa*			C		3/3
plants	monocots	Poaceae	*Iseilema membranaceum*	small flinders grass		C		1/1
plants	monocots	Poaceae	*Schizachyrium fragile*	firegrass		C		1/1
plants	monocots	Poaceae	*Sporobolus disjunctus*			C		2/2
plants	monocots	Poaceae	*Alloteropsis semialata*	cockatoo grass		C		2/2
plants	monocots	Poaceae	*Enneapogon lindleyanus*			C		1/1
plants	monocots	Poaceae	*Eragrostis pergracilis*			C		2/2
plants	monocots	Poaceae	*Urochloa subquadripara*		Y			1/1
plants	monocots	Poaceae	*Dactyloctenium radulans*	button grass		C		2/2
plants	monocots	Poaceae	*Digitaria hystrichoides*	umbrella grass		C		1/1
plants	monocots	Poaceae	*Eragrostis leptostachya*			C		1/1
plants	monocots	Poaceae	*Eragrostis spartinoides*			C		2/2
plants	monocots	Poaceae	*Sporobolus actinocladus*	katoora grass		C		4/4
plants	monocots	Poaceae	*Dactyloctenium aegyptium*	coast button grass	Y			1/1
plants	monocots	Poaceae	*Enneapogon robustissimus*			C		2/2
plants	monocots	Poaceae	*Sporobolus australasicus*			C		1/1
plants	monocots	Poaceae	*Sporobolus coromandelianus*		Y			2/2
plants	monocots	Poaceae	*Austrochloris dichanthioides*			C		3/3
plants	monocots	Poaceae	*Dactyloctenium buchananensis*			C		4/4
plants	monocots	Poaceae	*Cynodon dactylon var. dactylon*		Y			2/2
plants	monocots	Poaceae	*Aristida calycina var. calycina*			C		1/1
plants	monocots	Poaceae	*Aristida calycina var. praealta*			C		1/1
plants	monocots	Poaceae	*Dinebra decipiens var. decipiens*			C		1/1
plants	monocots	Poaceae	*Aristida holathera var. holathera*			C		4/4
plants	monocots	Poaceae	*Chloris divaricata var. divaricata*	slender chloris		C		1/1
plants	monocots	Poaceae	*Urochloa holosericea subsp. velutina*			C		1/1
plants	monocots	Poaceae	*Eriachne mucronata forma (Alpha C.E.Hubbard 7882)*			C		2/2
plants	monocots	Poaceae	*Eriachne mucronata forma (Burnham R.W.Purdie 1370)*			C		1/1
plants	monocots	Poaceae	*Aristida*			C		1
plants	monocots	Poaceae	*Eriachne*			C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Enneapogon*			C		1
plants	monocots	Poaceae	*Eragrostis*			C		1
plants	monocots	Poaceae	*Perotis rara*	comet grass		C		1/1
plants	monocots	Poaceae	*Melinis repens*	red natal grass	Y			1/1
plants	monocots	Poaceae	*Panicum simile*			C		1/1
plants	monocots	Poaceae	*Sarga plumosum*			C		2/2
plants	monocots	Poaceae	*Eriachne obtusa*			C		1/1
plants	monocots	Poaceae	*Panicum effusum*			C		2/2
plants	monocots	Ruppiaceae	*Ruppia*			C		1/1
plants	monocots	Ruppiaceae	*Ruppia maritima*	sea tassel		C		2/2
plants	monocots	Xanthorrhoeaceae	*Xanthorrhoea johnsonii*			C		1/1
plants		Streptophyceae	*Chara*			C		1/1
plants		Streptophyceae	*Lamprothamnium papulosum*			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix C

HERBRECS Database Search Results

CUMBERLAND ECOLOGY

Table C.1 HERBRECS Database Search Results

Family Name	Species Status[1]		Scientific Name
	EPBC Act	NC Act	
Acanthaceae	-	-	*Dipteracanthus australasicus* F.Muell. subsp. *australasicus*
Acanthaceae	-	-	*Nelsonia campestris* R.Br.
Acanthaceae	-	-	*Pseuderanthemum variabile* (R.Br.) Radlk.
Acanthaceae	-	-	*Rostellularia adscendens* (R.Br.) R.M.Barker
Aizoaceae	-	-	*Trianthema* sp. (Coorabulka R.W.Purdie 1404)
Aizoaceae	-	-	*Trianthema triquetra* Rottb. ex Willd.
Aizoaceae	-	-	*Zaleya galericulata* (Melville) H.Eichler
Amaranthaceae	-	-	*Alternanthera angustifolia* R.Br.
Amaranthaceae	-	-	**Alternanthera pungens* Kunth
Amaranthaceae	-	-	*Amaranthus interruptus* R.Br.
Amaranthaceae	-	-	*Gomphrena lanata* R.Br.
Amaranthaceae	-	-	*Gomphrena* sp. (Doongmabulla E.J.Thompson+ GAL137)
Amaranthaceae	-	-	*Ptilotus nobilis* subsp. *semilanatus* (Lindl.) A.R.Bean
Amaryllidaceae	-	-	*Calostemma luteum* Sims
Apiaceae	E	E	*Eryngium fontanum* A.E.Holland & E.J.Thomps.
Apiaceae	-	-	*Eryngium plantagineum* F.Muell.
Apiaceae	-	-	*Platysace valida* (F.Muell.) F.Muell.
Apocynaceae	-	-	*Marsdenia microlepis* Benth.
Apocynaceae	-	-	*Marsdenia viridiflora* R.Br. subsp. *viridiflora*
Araliaceae	-	V	*Hydrocotyle dipleura* A.R.Bean
Arecaceae	V	V	*Livistona lanuginosa* Rodd
Asteraceae	-	-	*Acmella grandiflora* var. *brachyglossa* (Benth.) R.K.Jansen
Asteraceae	-	-	*Apowollastonia spilanthoides* (F.Muell.) Orchard
Asteraceae	-	-	*Blumea diffusa* R.Br. ex Benth.
Asteraceae	-	-	*Calotis* sp. (Lake Buchanan J.Kemp+ 3384H)
Asteraceae	-	-	*Calotis xanthosioidea* Domin
Asteraceae	-	-	*Camptacra barbata* N.T.Burb.
Asteraceae	-	-	*Chrysocephalum apiculatum* (Labill.) Steetz
Asteraceae	-	-	**Emilia sonchifolia* (L.) DC. var. *sonchifolia*
Asteraceae	-	-	*Minuria integerrima* (DC.) Benth.
Asteraceae	-	-	*Olearia arguta* var. *lanata* Benth.
Asteraceae	-	-	*Olearia subspicata* (Hook.) Benth.

Family Name	Species Status[1]		Scientific Name
	EPBC Act	NC Act	
Asteraceae	-	-	**Parthenium hysterophorus* L.
Asteraceae	-	-	*Peripleura diffusa* (N.T.Burb.) G.L.Nesom
Asteraceae	-	-	*Peripleura scabra* (DC.) G.L.Nesom
Asteraceae	-	-	*Pluchea baccharoides* (F.Muell.) F.Muell. ex Benth.
Asteraceae	-	-	*Pluchea dentex* R.Br. ex Benth.
Asteraceae	-	-	*Pluchea rubelliflora* (F.Muell.) B.L.Rob.
Asteraceae	-	-	*Pluchea xanthina* A.R.Bean
Asteraceae	-	-	*Pterocaulon intermedium* (DC.) A.R.Bean
Asteraceae	-	-	*Pterocaulon serrulatum* (Montrouz.) Guillaumin var. *serrulatum*
Asteraceae	-	-	*Pterocaulon serrulatum* var. *velutinum* (Ewart & O.B.Davies) Guillaumin
Asteraceae	-	-	*Rutidosis leucantha* F.Muell.
Asteraceae	-	-	*Streptoglossa adscendens* (Benth.) Dunlop
Asteraceae	-	-	*Streptoglossa odora* (F.Muell.) Dunlop
Asteraceae	-	-	*Vittadinia pterochaeta* (F.Muell. ex Benth.) J.M.Black
Boraginaceae	-	-	*Ehretia membranifolia* R.Br.
Boraginaceae	-	-	*Heliotropium ovalifolium* Forssk.
Boraginaceae	-	-	*Heliotropium peninsulare* Craven
Byttneriaceae	-	-	*Keraudrenia collina* Domin
Byttneriaceae	-	-	*Keraudrenia hookeriana* Walp.
Byttneriaceae	-	-	*Keraudrenia nephrosperma* (F.Muell.) F.Muell.
Byttneriaceae	-	-	*Waltheria indica* L.
Caesalpiniaceae	-	-	*Labichea rupestris* Benth.
Caesalpiniaceae	-	-	**Parkinsonia aculeata* L.
Caesalpiniaceae	-	-	*Petalostylis labicheoides* R.Br.
Caesalpiniaceae	-	-	*Senna artemisioides* subsp. *oligophylla* (F.Muell.) Randell
Caesalpiniaceae	-	-	*Senna artemisioides* subsp. *sturtii* (R.Br.) Randell
Caesalpiniaceae	-	-	*Senna artemisioides* subsp. *zygophylla* (Benth.) Randell
Caesalpiniaceae	-	-	*Senna notabilis* (F.Muell.) Randell
Campanulaceae	-	-	*Isotoma* sp. (Myross R.J.Fensham 3883)
Campanulaceae	-	-	*Wahlenbergia gracilis* (G.Forst.) A.DC.
Campanulaceae	-	-	*Wahlenbergia queenslandica* Carolin ex P.J.Sm.
Campanulaceae	-	-	*Wahlenbergia tumidifructa* P.J.Sm.

Family Name	Species Status[1]		Scientific Name
	EPBC Act	NC Act	
Capparaceae	-	-	*Capparis lasiantha* R.Br. ex DC.
Caryophyllaceae	-	-	*Polycarpaea corymbosa* (L.) Lam.
Caryophyllaceae	-	-	*Polycarpaea spirostylis* subsp. *compacta* Pedley
Chenopodiaceae	-	-	*Atriplex*
Chenopodiaceae	-	-	*Atriplex lindleyi* Moq.
Chenopodiaceae	-	-	*Atriplex* sp. (Doongmabulla Homestead E.J.Thompson+ GAL20)
Chenopodiaceae	-	-	*Dissocarpus paradoxus* (R.Br.) F.Muell. ex Ulbr.
Chenopodiaceae	-	-	*Dissocarpus* sp. (Doongmabulla E.J.Thompson+ GAL21)
Chenopodiaceae	-	-	*Dysphania melanocarpa* (J.M.Black) Mosyakin & Clemants forma *melanocarpa*
Chenopodiaceae	-	-	*Dysphania plantaginella* F.Muell.
Chenopodiaceae	-	-	*Einadia trigonos* subsp. *stellulata* (Benth.) Paul G.Wilson
Chenopodiaceae	-	-	*Enchylaena tomentosa* R.Br.
Chenopodiaceae	-	-	*Maireana coronata* (J.M.Black) Paul G.Wilson
Chenopodiaceae	-	-	*Maireana dichoptera* (F.Muell.) Paul G.Wilson
Chenopodiaceae	-	-	*Maireana georgei* (Diels) Paul G.Wilson
Chenopodiaceae	-	-	*Maireana villosa* (Lindl.) Paul G.Wilson
Chenopodiaceae	-	-	*Rhagodia spinescens* R.Br.
Chenopodiaceae	-	-	*Salsola australis* R.Br.
Chenopodiaceae	-	-	*Sclerolaena anisacanthoides* (F.Muell.) Domin
Chenopodiaceae	-	-	*Sclerolaena bicornis* Lindl.
Chenopodiaceae	-	-	*Sclerolaena bicornis* Lindl. var. *bicornis*
Chenopodiaceae	-	-	*Sclerolaena calcarata* (Ising) A.J.Scott
Chenopodiaceae	-	-	*Sclerolaena convexula* (R.H.Anderson) A.J.Scott
Chenopodiaceae	-	-	*Sclerolaena diacantha* (Nees) Benth.
Chenopodiaceae	-	-	*Sclerolaena everistiana* (Ising) A.J.Scott
Chenopodiaceae	-	-	*Sclerolaena glabra* (F.Muell.) Domin
Chenopodiaceae	-	-	*Sclerolaena lanicuspis* (F.Muell.) F.Muell. ex Benth.
Chenopodiaceae	-	-	*Sclerolaena ramulosa* (C.T.White) A.J.Scott
Chenopodiaceae	-	-	*Sclerolaena tricuspis* (F.Muell.) Ulbr.
Chenopodiaceae	-	-	*Tecticornia indica* (Willd.) K.A.Sheph. & Paul G.Wilson
Chenopodiaceae	-	-	*Tecticornia pergranulata* subsp. *elongata* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson

Family Name	Species Status[1]		Scientific Name
	EPBC Act	NC Act	
Clusiaceae	-	-	*Hypericum gramineum* G.Forst.
Combretaceae	-	-	*Terminalia aridicola* Domin subsp. *aridicola*
Combretaceae	-	-	*Terminalia oblongata* F.Muell. subsp. *oblongata*
Commelinaceae	-	-	*Cyanotis axillaris* (L.) D.Don
Convolvulaceae	-	-	*Bonamia media* (R.Br.) Hallier f.
Convolvulaceae	-	-	*Bonamia media* (R.Br.) Hallier f. var. *media*
Convolvulaceae	-	-	*Evolvulus alsinoides* (L.) L.
Convolvulaceae	-	-	*Evolvulus alsinoides* var. *decumbens* (R.Br.) Ooststr.
Convolvulaceae	-	-	*Ipomoea argillicola* R.W.Johnson
Convolvulaceae	-	-	*Ipomoea brassii* C.T.White
Convolvulaceae	-	-	*Jacquemontia* sp. (Fairview R.W.Johnson 4026)
Convolvulaceae	-	-	*Polymeria calycina* R.Br.
Convolvulaceae	-	-	*Polymeria marginata* Benth.
Cyperaceae	-	-	*Baumea rubiginosa* (Spreng.) Boeckeler
Cyperaceae	-	-	*Bulbostylis barbata* (Rottb.) C.B.Clarke
Cyperaceae	-	-	*Cyperus alterniflorus* R.Br.
Cyperaceae	-	-	*Cyperus betchei* (Kuek.) S.T.Blake subsp. *betchei*
Cyperaceae	-	-	*Cyperus bifax* C.B.Clarke
Cyperaceae	-	-	*Cyperus bulbosus* Vahl
Cyperaceae	-	-	*Cyperus concinnus* R.Br.
Cyperaceae	-	-	*Cyperus conicus* (R.Br.) Boeckeler
Cyperaceae	-	-	*Cyperus conicus* (R.Br.) Boeckeler var. conicus
Cyperaceae	-	-	*Cyperus dactylotes* Benth.
Cyperaceae	-	-	*Cyperus difformis* L.
Cyperaceae	-	-	*Cyperus flaccidus* R.Br.
Cyperaceae	-	-	*Cyperus flavidus* Retz.
Cyperaceae	-	-	*Cyperus holoschoenus* R.Br.
Cyperaceae	-	-	*Cyperus iria* L.
Cyperaceae	-	-	*Cyperus laevigatus* L.
Cyperaceae	-	-	*Cyperus orgadophilus* K.L.Wilson
Cyperaceae	-	-	*Cyperus pulchellus* R.Br.
Cyperaceae	-	-	*Cyperus sanguinolentus* Vahl
Cyperaceae	-	-	*Cyperus squarrosus* L.

Family Name	Species Status[1]		Scientific Name
	EPBC Act	NC Act	
Cyperaceae	-	-	*Cyperus victoriensis* C.B.Clarke
Cyperaceae	-	-	*Eleocharis atropurpurea* (Retz.) Kunth
Cyperaceae	-	-	*Eleocharis equisetina* C.Presl
Cyperaceae	-	-	*Eleocharis plana* S.T.Blake
Cyperaceae	-	-	*Fimbristylis*
Cyperaceae	-	-	*Fimbristylis caespitosa* R.Br.
Cyperaceae	-	-	*Fimbristylis dichotoma* (L.) Vahl
Cyperaceae	-	-	*Fimbristylis littoralis* Gaudich.
Cyperaceae	-	-	*Fimbristylis macrantha* Boeckeler
Cyperaceae	-	-	*Fimbristylis microcarya* F.Muell.
Cyperaceae	-	-	*Fimbristylis neilsonii* F.Muell.
Cyperaceae	-	-	*Fimbristylis rara* R.Br.
Cyperaceae	-	-	*Fimbristylis* sp. (Lake Buchanan V.J.Neldner+ 3362)
Cyperaceae	-	-	*Fimbristylis squarrulosa* F.Muell.
Cyperaceae	-	-	*Fuirena ciliaris* (L.) Roxb.
Cyperaceae	-	-	*Fuirena incrassata* S.T.Blake
Cyperaceae	-	-	*Schoenoplectiella dissachantha* (S.T.Blake) Lye
Cyperaceae	-	-	**Schoenoplectiella erecta* (Poir.) Lye
Cyperaceae	-	-	*Schoenoplectiella laevis* (S.T.Blake) Lye
Cyperaceae	-	-	*Schoenoplectiella lateriflora* (J.F.Gmel.) Lye
Cyperaceae	-	-	*Schoenoplectus tabernaemontani* (C.C.Gmel.) Palla
Cyperaceae	-	-	*Schoenus kennyi* (F.M.Bailey) S.T.Blake
Cyperaceae	-	-	*Scleria sphacelata* F.Muell.
Cyperaceae	-	-	*Scleria tricuspidata* S.T.Blake
Dilleniaceae	-	-	*Hibbertia exutiacies* N.A.Wakef.
Eriocaulaceae	E	E	*Eriocaulon carsonii* subsp. *orientale* R.J.Davies
Euphorbiaceae	-	-	*Beyeria viscosa* Miq.
Euphorbiaceae	-	-	*Euphorbia*
Euphorbiaceae	-	-	*Euphorbia coghlanii* F.M.Bailey
Euphorbiaceae	-	-	*Euphorbia mitchelliana* Boiss. var. *mitchelliana*
Euphorbiaceae	-	-	*Euphorbia papillata* var. *laevicaulis* Halford & W.K.Harris
Euphorbiaceae	-	-	*Euphorbia petala* Ewart & L.R.Kerr
Euphorbiaceae	-	-	*Euphorbia stevenii* F.M.Bailey

Family Name	Species Status[1]		Scientific Name
	EPBC Act	NC Act	
Euphorbiaceae	-	-	*Euphorbia tannensis* subsp. *eremophila* (A.Cunn. ex T.Mitch.) D.C.Hassall
Euphorbiaceae	-	-	*Euphorbia thelephora* Halford & W.K.Harris var. *thelephora*
Euphorbiaceae	-	-	*Microstachys chamaelea* (L.) A.Juss. ex Hook.f.
Fabaceae	-	-	*Aeschynomene indica* L.
Fabaceae	-	-	*Cajanus marmoratus* (Benth.) F.Muell.
Fabaceae	-	-	*Cajanus scarabaeoides* (L.) Thouars var. *scarabaeoides*
Fabaceae	-	-	*Crotalaria medicaginea* var. *neglecta* (Wight & Arn.) Baker
Fabaceae	-	-	*Cullen cinereum* (Lindl.) J.W.Grimes
Fabaceae	-	-	*Desmodium filiforme* Zoll. & Moritzi
Fabaceae	-	-	*Gastrolobium grandiflorum* F.Muell.
Fabaceae	-	-	*Glycine tomentella* Hayata
Fabaceae	-	-	*Indigofera colutea* (Burm.f.) Merr.
Fabaceae	-	-	*Indigofera haplophylla* F.Muell.
Fabaceae	-	-	*Indigofera linifolia* (L.f.) Retz.
Fabaceae	-	-	*Indigofera linnaei* Ali
Fabaceae	-	-	*Indigofera pratensis* F.Muell.
Fabaceae	-	-	*Jacksonia ramosissima* Benth.
Fabaceae	-	-	*Jacksonia rhadinoclona* F.Muell.
Fabaceae	-	-	*Leptosema oxylobioides* F.Muell.
Fabaceae	-	-	*Lotus cruentus* Court
Fabaceae	-	-	*Mirbelia viminalis* (A.Cunn. ex Benth.) C.A.Gardner
Fabaceae	-	-	*Swainsona campylantha* F.Muell.
Fabaceae	-	-	*Swainsona swainsonioides* (Benth.) A.T.Lee ex J.M.Black
Fabaceae	-	-	*Tephrosia*
Fabaceae	-	-	*Tephrosia brachyodon* var. *longifolia* (Benth.) Domin
Fabaceae	-	-	*Tephrosia juncea* Benth.
Fabaceae	-	-	*Tephrosia leptoclada* Benth.
Fabaceae	-	-	*Tephrosia* sp. (Lake Buchanan E.J.Thompson+ BUC2128)
Fabaceae	-	-	*Tephrosia supina* Domin
Fabaceae	-	-	**Vigna luteola* (Jacq.) Benth.
Fabaceae	-	-	*Vigna vexillata* var. *angustifolia* (Schumach. & Thonn.) Baker
Fabaceae	-	-	*Zornia adenophora* (Domin) Mohlenbr.

Family Name	Species Status[1]		Scientific Name
	EPBC Act	NC Act	
Goodeniaceae	-	-	*Dampiera adpressa* A.Cunn. ex DC.
Goodeniaceae	-	-	*Goodenia expansa* A.E.Holland & T.P.Boyle
Goodeniaceae	-	-	*Goodenia gracilis* R.Br.
Goodeniaceae	-	-	*Goodenia grandiflora* Sims
Goodeniaceae	-	-	*Goodenia hirsuta* F.Muell.
Goodeniaceae	-	-	*Goodenia rosulata* Domin
Goodeniaceae	-	-	*Goodenia splendida* A.E.Holland & T.P.Boyle
Goodeniaceae	-	-	*Velleia macrocalyx* de Vriese
Haloragaceae	-	E	*Myriophyllum artesium* Halford & Fensham
Haloragaceae	-	-	*Myriophyllum verrucosum* Lindl.
Johnsoniaceae	-	-	*Tricoryne elatior* R.Br.
Juncaceae	-	-	*Juncus polyanthemus* Buchenau
Juncaceae	-	-	*Juncus usitatus* L.A.S.Johnson
Juncaginaceae	-	-	*Cycnogeton dubius* (R.Br.) Mering & Kadereit
Juncaginaceae	-	-	*Cycnogeton multifructus* (Aston) Mering & Kadereit
Lamiaceae	-	-	*Clerodendrum floribundum* R.Br.
Lamiaceae	-	-	**Ocimum x africanum* Lour.
Lamiaceae	-	-	*Plectranthus intraterraneus* S.T.Blake
Lamiaceae	-	-	*Prostanthera parvifolia* Domin
Lamiaceae	-	-	*Teucrium integrifolium* F.Muell.
Lauraceae	-	-	*Cassytha rufa* J.Z.Weber
Laxmanniaceae	-	-	*Laxmannia gracilis* R.Br.
Laxmanniaceae	-	-	*Lomandra leucocephala* (R.Br.) Ewart subsp. *leucocephala*
Laxmanniaceae	-	-	*Lomandra multiflora* (R.Br.) Britten subsp. *multiflora*
Laxmanniaceae	-	-	*Thysanotus chinensis* Benth.
Lentibulariaceae	-	-	*Utricularia caerulea* L.
Lentibulariaceae	-	-	*Utricularia fenshamii* R.W.Jobson
Lentibulariaceae	-	-	*Utricularia gibba* L.
Loganiaceae	-	-	*Mitrasacme* sp. (Warang M.B.Thomas 1571)
Loranthaceae	-	-	*Amyema bifurcata* (Benth.) Tiegh.
Loranthaceae	-	-	*Amyema quandang* (Lindl.) Tiegh. var. *quandang*
Loranthaceae	-	-	*Dendrophthoe glabrescens* (Blakely) Barlow
Loranthaceae	-	-	*Lysiana spathulata* subsp. *parvifolia* Barlow

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	EPBC Act	NC Act	
Loranthaceae	-	-	*Lysiana subfalcata* (Hook.) Barlow
Lythraceae	-	-	*Ammannia multiflora* Roxb.
Lythraceae	-	E	*Ammannia robertsii* (F.Muell.) S.A.Graham & Gandhi
Malvaceae	-	-	*Abutilon calliphyllum* Domin
Malvaceae	-	-	*Abutilon fraseri* (Hook.) Hook. ex Walp. subsp. *fraseri*
Malvaceae	-	-	*Gossypium australe* F.Muell.
Malvaceae	-	-	*Hibiscus leptocladus* Benth.
Malvaceae	-	-	*Hibiscus verdcourtii* Craven
Malvaceae	V	V	*Lawrencia buchananensis* Lander
Malvaceae	-	-	*Sida aprica* var. *solanacea* Domin
Malvaceae	-	-	*Sida atherophora* Domin
Malvaceae	-	-	*Sida brachypoda* F.Muell. ex A.E.Holland & S.T.Reynolds
Malvaceae	-	-	*Sida goniocarpa* (F.Muell. ex Benth.) Domin
Malvaceae	-	-	*Sida macropoda* F.Muell. ex Benth.
Malvaceae	-	-	*Sida rohlenae* Domin subsp. *rohlenae*
Malvaceae	-	-	*Sida* sp. (Charters Towers E.J.THompson+ CHA456)
Malvaceae	-	-	*Sida* sp. (Laglan Station L.S.Smith 10325)
Malvaceae	-	-	*Sida* sp. (Musselbrook M.B.Thomas+ MRS437)
Malvaceae	-	-	**Sida spinosa* L.
Malvaceae	-	-	*Sida trichopoda* F.Muell.
Marsileaceae	-	-	*Marsilea mutica* Mett.
Menyanthaceae	-	-	*Nymphoides indica* (L.) Kuntze
Mimosaceae	-	-	*Acacia acradenia* F.Muell.
Mimosaceae	-	-	*Acacia aneura* F.Muell. ex Benth. var. *aneura*
Mimosaceae	-	-	*Acacia argyrodendron* Domin
Mimosaceae	-	-	*Acacia cambagei* R.T.Baker
Mimosaceae	-	-	*Acacia catenulata* C.T.White
Mimosaceae	-	-	*Acacia decora* Rchb.
Mimosaceae	-	-	*Acacia excelsa* Benth. subsp. *excelsa*
Mimosaceae	-	-	*Acacia flavescens* A.Cunn. ex Benth.
Mimosaceae	-	-	*Acacia galioides* Benth.
Mimosaceae	-	-	*Acacia holosericea* A.Cunn. ex G.Don
Mimosaceae	-	-	*Acacia hyaloneura* Pedley

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Mimosaceae	-	-	*Acacia laccata* Pedley
Mimosaceae	-	-	*Acacia lazaridis* Pedley
Mimosaceae	-	-	*Acacia leptostachya* Benth.
Mimosaceae	-	-	*Acacia microcybe* Pedley
Mimosaceae	-	-	*Acacia oswaldii* F.Muell.
Mimosaceae	-	-	*Acacia platycarpa* F.Muell.
Mimosaceae	-	-	*Acacia salicina* Lindl.
Mimosaceae	-	-	*Acacia sericophylla* F.Muell.
Mimosaceae	-	-	*Acacia* sp. (Urandangi L.Pedley 2025)
Mimosaceae	-	-	*Acacia stipuligera* F.Muell.
Mimosaceae	-	-	*Acacia tenuissima* F.Muell.
Mimosaceae	-	-	*Acacia torulosa* Benth.
Mimosaceae	-	-	*Acacia uncifera* Benth.
Mimosaceae	-	-	*Neptunia dimorphantha* Domin
Mimosaceae	-	-	*Vachellia bidwillii* (Benth.) Kodela
Myrtaceae	-	-	*Calytrix microcoma* Craven
Myrtaceae	-	-	*Corymbia aparrerinja* K.D.Hill & L.A.S.Johnson - *C.dallachiana* (Benth.) K.D.Hill & L.A.S.Johnson
Myrtaceae	-	-	*Corymbia brachycarpa* (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson x *C.plena* K.D.Hill & L.A.S.Johnson
Myrtaceae	-	-	*Corymbia clarksoniana* (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson
Myrtaceae	-	-	*Corymbia lamprophylla* (Brooker & A.R.Bean) K.D.Hill & L.A.S.Johnson
Myrtaceae	-	-	*Corymbia leichhardtii* (F.M.Bailey) K.D.Hill & L.A.S.Johnson
Myrtaceae	-	-	*Corymbia plena* K.D.Hill & L.A.S.Johnson
Myrtaceae	-	-	*Corymbia setosa* subsp. *pedicellaris* K.D.Hill & L.A.S.Johnson
Myrtaceae	-	-	*Corymbia terminalis* (F.Muell.) K.D.Hill & L.A.S.Johnson
Myrtaceae	-	-	*Eucalyptus camaldulensis* subsp. *acuta* Brooker & M.W.McDonald
Myrtaceae	-	-	*Eucalyptus cambageana* Maiden
Myrtaceae	-	-	*Eucalyptus coolabah* Blakely & Jacobs
Myrtaceae	-	-	*Eucalyptus drepanophylla* F.Muell. ex Benth.
Myrtaceae	-	-	*Eucalyptus melanophloia* F.Muell. - E.whitei Maiden & Blakely

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Myrtaceae	-	-	*Eucalyptus melanophloia* F.Muell. subsp. *melanophloia*
Myrtaceae	-	-	*Eucalyptus melanophloia* F.Muell. *x E.populnea* F.Muell.
Myrtaceae	-	-	*Eucalyptus persistens* L.A.S.Johnson & K.D.Hill
Myrtaceae	-	-	*Eucalyptus populnea* F.Muell.
Myrtaceae	-	-	*Eucalyptus similis* Maiden
Myrtaceae	-	-	*Eucalyptus thozetiana* F.Muell. ex R.T.Baker
Myrtaceae	-	-	*Eucalyptus whitei* Maiden & Blakely
Myrtaceae	-	-	*Homoranthus thomasii* (F.Muell.) Craven & S.R.Jones
Myrtaceae	-	-	*Leptospermum lamellatum* Joy Thomps.
Myrtaceae	-	-	*Lithomyrtus microphylla* (Benth.) N.Snow & Guymer
Myrtaceae	-	-	*Melaleuca fluviatilis* Barlow
Myrtaceae	-	-	*Melaleuca leucadendra* (L.) L.
Myrtaceae	-	-	*Melaleuca nervosa* (Lindl.) Cheel
Myrtaceae	-	-	*Melaleuca pallescens* Byrnes
Myrtaceae	-	-	*Melaleuca tamariscina* Hook.f.
Myrtaceae	-	-	*Melaleuca uncinata* R.Br.
Myrtaceae	-	-	*Ochrosperma adpressum* A.R.Bean
Myrtaceae	-	-	*Thryptomene parviflora* (F.Muell. ex Benth.) Domin
Nyctaginaceae	-	-	*Boerhavia dominii* Meikle & Hewson
Nyctaginaceae	-	-	*Boerhavia paludosa* (Domin) Meikle
Nyctaginaceae	-	-	*Boerhavia pubescens* R.Br.
Nymphaeaceae	-	-	*Nymphaea gigantea* Hook.
Oleaceae	-	-	*Notelaea microcarpa* R.Br. var. *microcarpa*
Onagraceae	-	-	*Ludwigia perennis* L.
Orchidaceae	-	-	*Cymbidium canaliculatum* R.Br.
Orobanchaceae	-	-	*Buchnera linearis* R.Br.
Orobanchaceae	-	-	*Buchnera ramosissima* R.Br.
Pentapetaceae	-	-	*Melhania oblongifolia* F.Muell.
Phrymaceae	-	-	*Peplidium*
Phrymaceae	-	-	*Peplidium foecundum* W.R.Barker
Phyllanthaceae	-	-	*Phyllanthus* sp. (Pentland R.J.Cumming 9742)
Phyllanthaceae	-	-	*Phyllanthus virgatus* G.Forst.
Phyllanthaceae	-	-	*Poranthera microphylla* Brongn.

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Phyllanthaceae	-	-	*Sauropus elachophyllus* (F.Muell. ex Benth.) Airy Shaw var. *elachophyllus*
Picrodendraceae	-	-	*Petalostigma banksii* Britten & S.Moore
Plantaginaceae	-	-	**Scoparia dulcis* L.
Poaceae	-	-	*Acrachne racemosa* (B.Heyne ex Roem. & Schult.) Ohwi
Poaceae	-	-	*Alloteropsis cimicina* (L.) Stapf
Poaceae	-	-	*Alloteropsis semialata* (R.Br.) Hitchc.
Poaceae	-	-	*Amphipogon caricinus* F.Muell.
Poaceae	-	-	*Amphipogon caricinus* F.Muell. var. *caricinus*
Poaceae	-	-	*Amphipogon sericeus* (Vickery) T.D.Macfarl.
Poaceae	-	-	*Aristida benthamii* Henrard var. *benthamii*
Poaceae	-	-	*Aristida calycina* R.Br.
Poaceae	-	-	*Aristida calycina* R.Br. var. *calycina*
Poaceae	-	-	*Aristida calycina* var. *praealta* Domin
Poaceae	-	-	*Aristida contorta* F.Muell.
Poaceae	-	-	*Aristida helicophylla* S.T.Blake
Poaceae	-	-	*Aristida holathera* Domin var. *holathera*
Poaceae	-	-	*Aristida hygrometrica* R.Br.
Poaceae	-	-	*Aristida ingrata* Domin
Poaceae	-	-	*Aristida latifolia* Domin
Poaceae	-	-	*Aristida pruinosa* Domin
Poaceae	-	-	*Aristida sciuroides* Domin
Poaceae	-	-	*Astrebla elymoides* F.Muell. ex F.M.Bailey
Poaceae	-	-	*Astrebla pectinata* (Lindl.) F.Muell. ex Benth.
Poaceae	-	-	*Astrebla squarrosa* C.E.Hubb.
Poaceae	-	-	*Austrochloris dichanthioides* (Everist) Lazarides
Poaceae	-	-	*Bothriochloa bladhii* (Retz.) S.T.Blake subsp. *bladhii*
Poaceae	-	-	*Bothriochloa decipiens* var. *cloncurrensis* (Domin) C.E.Hubb.
Poaceae	-	-	*Bothriochloa ewartiana* (Domin) C.E.Hubb.
Poaceae	-	-	*Brachyachne tenella* (R.Br.) C.E.Hubb.
Poaceae	-	-	**Cenchrus ciliaris* L.
Poaceae	-	-	**Cenchrus pennisetiformis* Hochst. & Steud.
Poaceae	-	-	*Cenchrus purpurascens* Thunb.

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Poaceae	-	-	**Cenchrus setigerus* Vahl
Poaceae	-	-	*Chionachne hubbardiana* Henrard
Poaceae	-	-	*Chloris divaricata* R.Br. var. *divaricata*
Poaceae	-	-	**Chloris inflata* Link
Poaceae	-	-	*Chloris pectinata* Benth.
Poaceae	-	-	*Chloris* sp. (Edgbaston R.J.Fensham 5694)
Poaceae	-	-	**Chloris virgata* Sw.
Poaceae	-	-	*Chrysopogon fallax* S.T.Blake
Poaceae	-	-	*Cymbopogon ambiguus* A.Camus
Poaceae	-	-	*Cymbopogon bombycinus* (R.Br.) Domin
Poaceae	-	-	*Cymbopogon obtectus* S.T.Blake
Poaceae	-	-	**Cynodon dactylon* (L.) Pers. var. *dactylon*
Poaceae	-	-	**Dactyloctenium aegyptium* (L.) Willd.
Poaceae	-	-	*Dactyloctenium buchananensis* B.K.Simon
Poaceae	-	-	*Dactyloctenium radulans* (R.Br.) P.Beauv.
Poaceae	-	-	**Dichanthium annulatum* (Forssk.) Stapf
Poaceae	-	-	*Dichanthium fecundum* S.T.Blake
Poaceae	-	-	*Dichanthium sericeum* (R.Br.) A.Camus subsp. *sericeum*
Poaceae	-	-	*Digitaria bicornis* (Lam.) Roem. & Schult.
Poaceae	-	-	*Digitaria breviglumis* (Domin) Henrard
Poaceae	-	-	*Digitaria brownii* (Roem. & Schult.) Hughes
Poaceae	-	-	**Digitaria ciliaris* (Retz.) Koeler
Poaceae	-	-	*Digitaria diminuta* Hughes
Poaceae	-	-	*Digitaria divaricatissima* (R.Br.) Hughes
Poaceae	-	-	*Digitaria hystrichoides* Vickery
Poaceae	-	-	*Digitaria longiflora* (Retz.) Pers.
Poaceae	-	-	*Dinebra decipiens* (R.Br.) P.M.Peterson & N.Snow var. *decipiens*
Poaceae	-	-	*Dinebra ligulata* (Lazarides) P.M.Peterson & N.Snow
Poaceae	-	-	*Diplachne fusca* (L.) P.Beauv. ex Roem. & Schult. var. *fusca*
Poaceae	-	-	**Echinochloa colona* (L.) Link
Poaceae	-	-	**Echinochloa crus-galli* (L.) P.Beauv.
Poaceae	-	-	*Echinochloa inundata* P.W.Michael & Vickery

Family Name	Species Status[1]		Scientific Name
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Poaceae	-	-	*Elionurus citreus* (R.Br.) Munro ex Benth.
Poaceae	-	-	*Enneapogon avenaceus* (Lindl.) C.E.Hubb.
Poaceae	-	-	*Enneapogon gracilis* (R.Br.) P.Beauv.
Poaceae	-	-	*Enneapogon lindleyanus* (Domin) C.E.Hubb.
Poaceae	-	-	*Enneapogon polyphyllus* (Domin) N.T.Burb.
Poaceae	-	-	*Enneapogon robustissimus* (Domin) N.T.Burb.
Poaceae	-	-	*Enneapogon truncatus* Kakudidi
Poaceae	-	-	*Enneapogon virens* (Lindl.) Kakudidi
Poaceae	-	-	*Enteropogon acicularis* (Lindl.) Lazarides
Poaceae	-	-	*Enteropogon ramosus* B.K.Simon
Poaceae	-	-	*Eragrostis basedowii* Jedwabn.
Poaceae	-	-	*Eragrostis cumingii* Steud.
Poaceae	-	-	*Eragrostis dielsii* Pilg.
Poaceae	-	-	*Eragrostis elongata* (Willd.) J.Jacq.
Poaceae	-	-	*Eragrostis falcata* (Gaudich.) Gaudich. ex Steud.
Poaceae	-	-	*Eragrostis filicaulis* Lazarides
Poaceae	-	-	*Eragrostis lacunaria* F.Muell. ex Benth.
Poaceae	-	-	*Eragrostis lanicaulis* Lazarides
Poaceae	-	-	*Eragrostis leptocarpa* Benth.
Poaceae	-	-	*Eragrostis leptostachya* (R.Br.) Steud.
Poaceae	-	-	*Eragrostis microcarpa* Vickery
Poaceae	-	-	*Eragrostis parviflora* (R.Br.) Trin.
Poaceae	-	-	*Eragrostis pergracilis* S.T.Blake
Poaceae	-	-	**Eragrostis pilosa* (L.) P.Beauv.
Poaceae	-	-	*Eragrostis sororia* Domin
Poaceae	-	-	*Eragrostis* sp. (Lakefield NP J.R.Clarkson+ 7010)
Poaceae	-	-	*Eragrostis spartinoides* Steud.
Poaceae	-	-	*Eragrostis speciosa* (Roem. & Schult.) Steud.
Poaceae	-	-	*Eragrostis xerophila* Domin
Poaceae	-	-	*Eriachne aristidea* F.Muell.
Poaceae	-	-	*Eriachne ciliata* R.Br.
Poaceae	-	-	*Eriachne mucronata* forma (Alpha C.E.Hubbard 7882)
Poaceae	-	-	*Eriachne mucronata* forma (Burnham R.W.Purdie 1370)

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Poaceae	-	-	*Eriachne obtusa* R.Br.
Poaceae	-	-	*Eriochloa procera* (Retz.) C.E.Hubb.
Poaceae	-	-	*Eriochloa pseudoacrotricha* (Stapf ex Thell.) J.M.Black
Poaceae	-	-	*Eulalia aurea* (Bory) Kunth
Poaceae	-	-	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.
Poaceae	-	-	**Hymenachne amplexicaulis* (Rudge) Nees cv. Olive
Poaceae	-	-	*Isachne globosa* (Thunb.) Kuntze
Poaceae	-	-	*Ischaemum australe* R.Br. var. *australe*
Poaceae	-	-	*Ischaemum australe* var. *villosum* (R.Br.) Benth.
Poaceae	-	-	*Iseilema membranaceum* (Lindl.) Domin
Poaceae	-	-	*Iseilema vaginiflorum* Domin
Poaceae	-	-	*Leersia hexandra* Sw.
Poaceae	-	-	**Melinis repens* (Willd.) Zizka
Poaceae	-	-	*Mnesithea formosa* (R.Br.) de Koning & Sosef
Poaceae	-	-	*Oxychloris scariosa* (F.Muell.) Lazarides
Poaceae	-	-	*Panicum effusum* R.Br.
Poaceae	-	-	*Panicum laevinode* Lindl.
Poaceae	-	-	*Panicum simile* Domin
Poaceae	-	-	*Paspalidium albovillosum* S.T.Blake
Poaceae	-	-	*Paspalidium caespitosum* C.E.Hubb.
Poaceae	-	-	*Paspalidium constrictum* (Domin) C.E.Hubb.
Poaceae	-	-	*Paspalidium distans* (Trin.) Hughes
Poaceae	-	-	*Paspalidium gracile* (R.Br.) Hughes
Poaceae	-	-	*Paspalidium jubiflorum* (Trin.) Hughes
Poaceae	-	-	*Paspalidium rarum* (R.Br.) Hughes
Poaceae	-	-	*Paspalum vaginatum* Sw.
Poaceae	-	-	*Perotis rara* R.Br.
Poaceae	-	-	*Pseudoraphis spinescens* (R.Br.) Vickery
Poaceae	-	-	*Sacciolepis indica* (L.) Chase
Poaceae	-	-	*Sarga plumosum* (R.Br.) Spangler
Poaceae	-	-	*Schizachyrium fragile* (R.Br.) A.Camus
Poaceae	-	-	*Sehima nervosum* (Rottler) Stapf
Poaceae	-	-	*Setaria dielsii* R.A.W.Herrm.

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Poaceae	-	-	*Setaria paspalidioides* Vickery
Poaceae	-	-	*Setaria surgens* Stapf
Poaceae	-	-	*Sporobolus actinocladus* (F.Muell.) F.Muell.
Poaceae	-	-	*Sporobolus australasicus* Domin
Poaceae	-	-	*Sporobolus caroli* Mez
Poaceae	-	-	**Sporobolus coromandelianus* (Retz.) Kunth
Poaceae	-	-	*Sporobolus disjunctus* R.Mills ex B.K.Simon
Poaceae	-	E	*Sporobolus pamelae* B.K.Simon
Poaceae	-	-	*Sporobolus partimpatens* R.Mills ex B.K.Simon
Poaceae	-	-	*Sporobolus scabridus* S.T.Blake
Poaceae	-	-	*Sporobolus virginicus* (L.) Kunth
Poaceae	-	-	*Thaumastochloa major* S.T.Blake
Poaceae	-	-	*Themeda avenacea* (F.Muell.) Maiden & Betche
Poaceae	-	-	*Themeda triandra* Forssk.
Poaceae	-	-	*Tragus australianus* S.T.Blake
Poaceae	-	-	*Triodia longiceps* J.M.Black
Poaceae	-	-	*Triodia microstachya* R.Br.
Poaceae	-	-	*Triodia pungens* R.Br.
Poaceae	-	-	*Tripogon loliiformis* (F.Muell.) C.E.Hubb.
Poaceae	-	-	*Triraphis mollis* R.Br.
Poaceae	-	-	*Urochloa gilesii* (Benth.) Hughes var. *gilesii*
Poaceae	-	-	*Urochloa holosericea* (R.Br.) R.D.Webster subsp. *holosericea*
Poaceae	-	-	*Urochloa holosericea* subsp. *velutina* R.D.Webster
Poaceae	-	-	**Urochloa mosambicensis* (Hack.) Dandy
Poaceae	-	-	*Urochloa piligera* (F.Muell. ex Benth.) R.D.Webster
Poaceae	-	-	*Urochloa reptans* (L.) Stapf
Poaceae	-	-	**Urochloa subquadripara* (Trin.) R.D.Webster
Poaceae	-	-	*Whiteochloa airoides* (R.Br.) Lazarides
Polygalaceae	-	-	*Polygala crassitesta* R.A.Kerrigan
Polygalaceae	-	-	*Polygala difficilis* R.A.Kerrigan
Polygalaceae	-	-	*Polygala pycnantha* R.A.Kerrigan
Polygalaceae	-	-	*Polygala triflora* L.
Polygonaceae	-	-	*Persicaria decipiens* (R.Br.) K.L.Wilson

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Portulacaceae	-	-	*Calandrinia ptychosperma* F.Muell.
Portulacaceae	-	-	**Portulaca oleracea* L.
Portulacaceae	-	-	*Portulaca oligosperma* F.Muell.
Portulacaceae	-	-	*Portulaca tuberosa* Roxb.
Potamogetonaceae	-	-	*Potamogeton tricarinatus* F.Muell. & A.Benn. ex A.Benn.
Proteaceae	-	-	*Grevillea decora* Domin subsp. *decora*
Proteaceae	-	-	*Grevillea juncifolia* Hook. subsp. *juncifolia*
Proteaceae	-	-	*Grevillea parallela* Knight
Proteaceae	-	-	*Grevillea pteridifolia* Knight
Proteaceae	-	-	*Grevillea sessilis* C.T.White & W.D.Francis
Proteaceae	-	-	*Hakea leucoptera* R.Br.
Proteaceae	-	-	*Persoonia falcata* R.Br.
Rhamnaceae	-	-	*Alphitonia excelsa* (Fenzl) Benth.
Rubiaceae	-	-	*Everistia vacciniifolia* forma *crassa* S.T.Reynolds & R.J.F.Hend.
Rubiaceae	-	-	*Oldenlandia mitrasacmoides* (F.Muell.) F.Muell.
Rubiaceae	-	-	*Oldenlandia mitrasacmoides* subsp. *nigricans* Halford
Rubiaceae	-	-	*Psydrax attenuata* forma *megalantha* S.T.Reynolds & R.J.F.Hend.
Rubiaceae	-	-	*Psydrax forsteri* S.T.Reynolds & R.J.F.Hend.
Rubiaceae	-	-	*Psydrax saligna* S.T.Reynolds & R.J.F.Hend. forma *saligna*
Rubiaceae	-	-	*Spermacoce brachystema* R.Br. ex Benth.
Rubiaceae	-	-	*Synaptantha tillaeacea* (F.Muell.) Hook.f. var. *tillaeacea*
Ruppiaceae	-	-	*Ruppia*
Ruppiaceae	-	-	*Ruppia maritima* L.
Rutaceae	-	-	*Flindersia maculosa* (Lindl.) Benth.
Rutaceae	-	-	*Geijera salicifolia* Schott
Santalaceae	-	-	*Santalum lanceolatum* R.Br.
Sapindaceae	-	-	*Atalaya hemiglauca* (F.Muell.) F.Muell. ex Benth.
Sapindaceae	-	-	*Dodonaea dodecandra* (Domin) M.G.Harr.
Sapindaceae	-	-	*Dodonaea filifolia* Hook.
Sapindaceae	-	-	*Dodonaea lanceolata* var. *subsessilifolia* J.G.West
Sapindaceae	-	-	*Dodonaea tenuifolia* Lindl.
Sapindaceae	-	-	*Dodonaea vestita* Hook.

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	EPBC Act	NC Act	
Sapindaceae	-	-	*Dodonaea viscosa* subsp. *angustissima* (DC.) J.G.West
Scrophulariaceae	-	-	*Eremophila deserti* (A.Cunn. ex Benth.) Chinnock
Scrophulariaceae	-	-	*Eremophila glabra* (R.Br.) Ostenf. - *E.latrobei* F.Muell.
Scrophulariaceae	-	-	*Eremophila latrobei* F.Muell.
Scrophulariaceae	-	-	*Eremophila latrobei* F.Muell. subsp. *latrobei*
Scrophulariaceae	-	-	*Eremophila maculata* (Ker Gawl.) F.Muell. subsp. *maculata*
Scrophulariaceae	-	-	*Eremophila mitchellii* Benth.
Solanaceae	-	-	*Solanum cleistogamum* Symon
Solanaceae	-	-	*Solanum crebrispinum* A.R.Bean
Solanaceae	-	-	*Solanum esuriale* Lindl.
Solanaceae	-	-	**Solanum nodiflorum* Jacq.
Solanaceae	-	-	*Solanum parvifolium* R.Br. subsp. *parvifolium*
Sparrmanniaceae	-	-	*Corchorus sidoides* subsp. *vermicularis* (F.Muell.) Halford
Sparrmanniaceae	-	-	*Grewia retusifolia* Kurz
Stackhousiaceae	-	-	*Stackhousia intermedia* F.M.Bailey
Streptophyceae	-	-	*Chara*
Streptophyceae	-	-	*Lamprothamnium papulosum* (Wallr.) J.Groves
Stylidiaceae	-	-	*Stylidium adenophorum* Lowrie & Kenneally
Stylidiaceae	-	-	*Stylidium eglandulosum* F.Muell.
Stylidiaceae	-	-	*Stylidium eriorhizum* R.Br.
Typhaceae	-	-	*Typha domingensis* Pers.
Verbenaceae	-	-	*Verbena macrostachya* F.Muell.
Violaceae	-	-	*Hybanthus enneaspermus* (L.) F.Muell.
Violaceae	-	-	*Hybanthus stellarioides* (Domin) P.I.Forst.
Xanthorrhoeaceae	-	-	*Xanthorrhoea johnsonii* A.T.Lee
Zygophyllaceae	-	-	*Tribulopis angustifolia* R.Br.

[1] Threatened, migratory and/or marine species status under the NC Act and/or EPBC Act (current at 6 March 2015).

E = Endangered; V = Vulnerable

* Introduced species.

Appendix D

Summary of Flora and Fauna Surveys Undertaken at the Approved CCM&RP

Table D.1 Summary of Flora and Fauna Surveys Undertaken at the Approved CCM&RP

Project	Distance to Study Area	Field Survey Periods	Fauna Survey Methods	Flora Survey Methods
Carmichael Coal Mine and Rail Project EIS				
Terrestrial Ecology Report (GHD, 2012c)	Adjacent	9 – 13 November 2010 5 – 9 April 2011 13 – 17 April 2011 4 – 8 May 2011	A total of 16 comprehensive survey sites, surveyed over five days and four consecutive nights, each containing up to: • 20 Elliot A traps (total 1780 trap nights); • 10 cage traps (total 792 trap nights); • Four pitfall/funnel trap/draft fences (total 1008 trap nights); • Min 1 hour opportunistic surveys; • 20 minute bird surveys (total 22 person hours); • Min 1 hour diurnal active searches for reptiles and amphibians (total 22 person hours); • One hour nocturnal spot lighting and call-playback (plus additional 20 hours taken on roads) (total 19 person hours); • Min 1 night Anabat bat detectors (total 22 nights); • One to four nights of remote cameras;	20 comprehensive survey sites comprising: • Quadrat sampling; • Site species lists; • Random meander and targeted habitat search techniques; • Verification of REs using quaternary site assessments; and • Site descriptions. 160 rapid assessment sites comprising: • Quadrat sampling; • Site species lists; • Random meander and targeted habitat search techniques; • Verification of REs using quaternary site assessments; and • Site descriptions.

Project	Distance to Study Area	Field Survey Periods	Fauna Survey Methods	Flora Survey Methods
			• Habitat assessment; and • Incidental observations. A total of 36 rapid survey sites, surveyed over five days and four consecutive nights, each containing up to: • Min 0.5 hours opportunistic surveys; • 20 minute bird surveys; • Min 0.5 hour diurnal active searches for reptiles and amphibians; • One hour nocturnal spot lighting and call-playback; • Habitat assessment; • Incidental observations; • Detailed targeted Black-throated Finch (white-rumped subspecies) surveys (41.5 person hours); and • Targeted Squatter Pigeon (southern subspecies), Ornamental Snake and Yakka Skink surveys.	
Matters of National Environmental Significance (GHD, 2012b)	Adjacent	No additional surveys undertaken.	No additional surveys undertaken.	No additional surveys undertaken.
Moray Downs Black-	Adjacent	21 – 26 May 2012	Surveys comprised:	No additional surveys undertaken.

Project	Distance to Study Area	Field Survey Periods	Fauna Survey Methods	Flora Survey Methods
throated Finch Surveys (GHD, 2012a)			• Nine water source watches (total 27.8 person hours); • Min 20 minute surveys at 2 ha survey sites (total 21 person hours); • Nine remote fauna cameras over six water sources for at least one day; • Habitat assessments; and • Incidental observations.	
Carmichael Coal Mine and Rail Project SEIS				
Report for Updated Mine Ecology (GHD, 2013b)	Adjacent	No additional surveys undertaken.	No additional surveys undertaken.	No additional surveys undertaken.
Report for Matters of National Environmental Significance (GHD, 2013a)	Adjacent	No additional surveys undertaken.	No additional surveys undertaken.	No additional surveys undertaken.
Report for Black-throated Finch On-site Monitoring Survey 1 (GHD, 2013c)	Adjacent	23 – 31 May 2013	Surveys comprised: • Watching eight waterbodies for Black-throated Finches (white-rumped subspecies), conducted by at least two people (and sometimes up to four people) with at least one person watching the waterbody for the full duration of the survey and one person actively searching the for signs of the Black-throated Finch (white-rumped	No additional surveys undertaken.

Project	Distance to Study Area	Field Survey Periods	Fauna Survey Methods	Flora Survey Methods
			subspecies) (i.e. nests, etc.); • 52 x 2 ha woodland habitat survey sites which included 20 minute bird surveys; • Twenty cameras installed at a range of different water bodies; • Incidental sightings; and • Habitat assessments.	
Carmichael Coal Mine and Rail Project AEIS				
Black-throated Finch Management Plan (GHD, 2014a)	Adjacent	August and October 2013	No additional surveys undertaken.	No additional surveys undertaken.
Report for Black-throated Finch On-site Monitoring Survey 2 (GHD, 2014b)	Adjacent	20 – 29 October 2013	Surveys comprised: • Watching 16 waterbodies for Black-throated Finches (white-rumped subspecies), conducted by at least two people (and sometimes up to four people) with at least one person watching the waterbody for the full duration of the survey (between 0.3 and 5 hours at each waterbody) and one person actively searching a 600 m radius around the waterbody for signs of the Black-throated Finch	No additional surveys undertaken.

Project	Distance to Study Area	Field Survey Periods	Fauna Survey Methods	Flora Survey Methods
			(white-rumped subspecies) (i.e. nests, etc.) • Area counts; • A total of 17 remote fauna cameras set at waterbodies over five nights; and • Recording incidental records of the Black-throated Finch (white-rumped subspecies), including number observed, the number of adults and juveniles, observations on feeding, drinking, perching, preening, begging by young, flighting, nesting and mating.	
Ecological Equivalence Assessment Stage 2 (Eco Logical Australia, 2014)	Adjacent	9 – 16 December 2013	Targeted surveys for Black-throated Finch (white-rumped subspecies) habitat components, comprising searches for: • Key grass species eaten by the Black-throated Finch (white-rumped subspecies); and • Permanent waterbodies in Black-throated Finch (eastern subspecies) habitat.	Surveys comprised: • Surveying the ecological condition of 46 sites (43 sites were 100 m X 50 m plots, while the remaining three sites were 100 X 25 m plots).

Appendix E

Team Members CVs

David Robertson

Director

Dr David Robertson is a senior ecologist with more than 20 years experience in ecological survey and research. David is the director of Cumberland Ecology. He has a bachelor of science with majors in botany and zoology and a PhD in ecology.

Recent consultancy work has included:

- Participation as senior ecological consultant for Department of Planning on the South Coast Environmental Panel;
- Provision of expert testimony, acting as a Court appointed expert for the Land and Environment Court;
- Management of high level flora and fauna investigations for Environmental Impact Assessments;
- Development of ecological management plans;
- Habitat reconstruction;
- Development of packages for compensatory habitats; and
- Management of negotiations about the level of mitigation measures required for flora and fauna impacts.

David is also very experienced at public speaking and has regularly provided expert testimony in court concerning ecological issues.

In previous work David was employed as the senior ecologist in charge of the Ecological Services Practice for ERM Australia. He also lectured in ecology and aquatic biology at Charles Sturt University, and was employed as a senior ecologist with the Australian Museum.

David has skills that allow him to work in both aquatic and terrestrial flora and fauna inventory, management of threatened species, ecological risk assessment, wetland rehabilitation and management, and ecological research for environmental impact assessment.

Fields of Competence

Biodiversity issues, flora and fauna field surveys, aquatic ecology, biological monitoring and environmental impact assessment.

- Bushfire assessments.
- Provision of strategic advice relating to the ecological issues that must be considered for land purchase, development and management.

Key Industry Sectors

- Mining
- Power
- Water
- Transport

Education

Bachelor of Science (Honours), Ecology, University of Melbourne, 1980.

Doctor of Philosophy, Ecology, University of Melbourne, 1986.

International Experience

International threatened species assessments have been completed in Hong Kong, China and Sri Lanka.

Work on threatened species has included preliminary survey and impact assessment, detailed impact assessment and mitigation, monitoring and plans of management.

His experience includes working for the KCRC Habitat Creation and Management Plan, assessments of impacts of construction on rare fishes for the West Rail project, development of mapping units for mapping Hong Kong flora and fauna habitats for the SUSDEV project and for the Green Island Ecological assessments.

Dr Robertson is familiar with the West Rail project and has helped write the Habitat Creation and Management Plan. He has visited the sites

proposed for the wetland creation project and understands the habitat requirements of the target species such as the Painted Snipe and the Narrow-mouthed Frog.

David also has mangrove and tropical rainforest management experience in western Sri Lanka.

Key Projects

Environmental Impact Assessment

David has directed numerous large ecological assessments for major EIA projects in a variety of service sectors. These include the power industry, water supply, road construction and mining. Experience in ecological impact assessment for the power industry includes work done for Pacific Power, Transgrid, Powercoal, NorthPower and Powerlink.

Threatened species assessments

David has directed or managed numerous threatened species assessments in Australia and overseas on threatened species.

Across Australia, he has completed numerous projects on threatened species in response to state and commonwealth threatened species legislation. Such legislation includes the *NSW Threatened Species Conservation Act 1995*, *Queensland Nature Conservation Act 1994* and the *Victorian Flora and Fauna Conservation Guarantee 1998* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Provision of Strategic Ecological Advice

Strategic ecological advice has been provided to aid the selection of potential development sites in Australia, Hong Kong, Sri Lanka and China. Examples include: a model to help minimise problems with threatened species issues developed for use by Landcom.

Bushfire Assessments

A range of bushfire assessments have been prepared for sites ranging from small allotments for single dwellings to bushfire management plans for large sites (eg the ADI site at St Marys and Majura Field Firing Range in the ACT).

Aquatic Assessments

Dr Robertson has written, directed the writing or reviewed numerous wetland ecology projects that involve aquatic habitat assessment, creation and management. Some recent examples include the wetland creation and management projects at the Homebush Olympic Games Venue sites, Coffs Clarence Regional Water Supply Project, the Parramatta Chatswood Rail Link, the proposed extension to Ravensworth East Coal Mine and the Karuah to Buladelah Pacific Highway Upgrade.

He has worked on a wide range of large EIS projects that have included assessment of impacts, mitigation and monitoring of wetlands. Currently David is preparing ecological habitat reconstruction of wetlands for the Cooks Cove Redevelopment in Sydney. He has also conducted research into wetland ecology and artificial wetland design while he lectured in aquatic ecology at Charles Sturt University.

Dr Robertson has worked extensively throughout Australia on freshwater ecological projects and has considerable experience with macroinvertebrate biomonitoring following the AUSRIVAS protocol.

- Homebush Bay and Newington Wetlands (for Olympic developments whilst at the Australian Museum);
- Anna Bay Saltmarsh and Wetland assessment;
- Saltmarsh and mangrove assessments along Duck River;
- Saltmarsh and mangrove assessments along Kurnell Peninsula; and
- Mangrove and tropical rainforest management in western Sri Lanka.

David's wetlands skills are demonstrated by:

- Work for Department of Planning on an expert panel, assessing 17 major sites on the south coast of NSW;

- Provision of expert testimony, acting as a Court appointed expert for the Land and Environment Court;
- Management of high level flora and fauna investigations for Environmental Impact Assessments;
- Development of ecological management plans;
- Habitat reconstruction;
- Development of packages for compensatory habitats; and
- Management of negotiations about the level of mitigation measures required for flora and fauna impacts.

EPBC/DEH Experience

David has extensive experience with assessments for the *Environment Protection and Biodiversity Conservation Act 1999*. He has also worked many times with the Department of the Environment and Heritage in Canberra and so has a good number of senior contacts in that organisation.

David has prepared numerous referrals for a wide range of projects since the gazettal of the EPBC Act. These have included referrals for projects in Victoria, ACT, NSW and Queensland and have entailed such diverse projects as coal mines, highways, transmission lines, residential and tourist developments and water supply projects.

David has also worked on complex ongoing assessments that are required for controlled actions to obtain approvals. He has done this for open cut coal mines, transmission lines, tourist developments, golf courses and water supply projects.

David is an excellent negotiator and presenter – and is adept at giving effective presentations to DEH and other organisations when required. Previously, for a number of projects he has also given direct presentations to Ministers.

David has a thorough understanding of the EPBC/DEH process and can manage the passage of difficult projects in order to gain approvals.

He has also worked on several Brush-tailed Rock Wallaby projects including impact assessments and management plans for Rock Wallabies on the Timbarra Plateau, Shannon Creek and Chambigne Nature Reserve. As part of his work at Shannon Creek, David is working on an eight year monitoring project for Brush-tailed Rock-wallaby and foxes (which are a major threat to the wallaby).

Recent consultancy work has included:

- Work for the Land and Environment Court as an expert witness;
- Work for Department of Defence as expert on kangaroo management;
- Management of high level flora and fauna investigations for Environmental Impact Assessments;
- Threatened species investigations;
- Development of ecological management plans;
- Development of packages for compensatory habitats;
- Ecological risk assessment.

Statements of evidence and expert testimony

Dr David Robertson is a highly experienced and credible expert witness and is capable of providing expert evidence in both terrestrial and aquatic areas of ecology. David has provided expert evidence for Senate Select Committees, Australian Heritage Commission, Commissions of Inquiry, Land and Environment Court hearings and at Mining Wardens inquiries.

He has written numerous affidavits and technical reports for court and regularly presents in court for cross examination. He also assists barristers by writing questions for cross examining expert witnesses in ecology and by taking Judges and Assessors on field inspections of proposed development sites.

Significant Experience

ADI site at St Marys

Dr David Robertson, the Principal, has worked on the site since 1997. It has almost certainly entailed the most intensive kangaroo herding and fertility control work yet conducted on a captive population.

The 1,500 ha ADI site has over 800 hectares of endangered Cumberland Plain Woodland and affiliated vegetation. It also supports a suite of threatened and regionally significant species that were threatened by overgrazing by Eastern Grey Kangaroos and Red Kangaroos, both of which had been introduced to this fenced property.

Ecological work by Dr Robertson at the ADI site has included ecological assessments and planning work for the rezoning of the 1,500 ha property, ecological impact assessment for Precincts within the ADI, ecological impact assessment for individual Development Applications, preparation of management plans (for weeds, feral animals, threatened species and kangaroos) and implementation of management plans.

Dr Robertson prepared a detailed Kangaroo Management Plan for the ADI Site, which entailed herding, darting, fertility control and long term management and monitoring of kangaroos to reduce the population. A management plan was then implemented, hiring and managing veterinary surgeons, veterinary nurses, animal handling people and ecologists. This work entailed numerous herds of kangaroos over areas that were as large as 800 ha. During the course of the project he hired and managed over 100 staff (including casual herders).

The value of ecological project work completed by Dr Robertson on the ADI property exceeds $1.5 million dollars and spans the past five years.

Cooks Cove Development Area

This is a staged development application that Dr Robertson has been working on with team of other consultants including planning, engineering and land contamination specialists. The project involves the construction of a trade and technology park and associated infrastructure adjacent to Sydney Airport as well as the relocation of a golf course to an area that contains endangered ecological communities and threatened species that are protected under the Threatened Species Conservation Act and for some species, commonwealth and international law.

Dr Robertson's role in the project has been to assess the options for offsets and management of land for threatened species and to manage the negotiation and consultation process between the developer, state and federal governments and the public. His team has prepared detailed plans and related costs for the rehabilitation of wetlands on the site and the management of threatened species, which have been subject to public exhibition.

The development application has now been approved by both State and Federal governments and ongoing work concerning the detailed design is underway.

Central Hills Ecological Assessment

The Central Hills Local Environment Study involved assessing opportunities and constraints for development within Camden LGA and developing a plan for green offsets. This required lengthy and ongoing adjustment to plans and ongoing liaison with Camden Council and landowners.

Dr Robertson carried out a flora and fauna assessment in accordance with the consultancy brief prepared by APP Pty Ltd on behalf of Camden City Council. To achieve this aim, the ecological assessment was designed to identify:

- Areas where development may occur without further site survey;
- Significant areas where no development should occur, or areas of high sensitivity requiring further surveys or a Species Impact Statement; and

- Areas of high conservation significance that could be reserved and / or managed for biodiversity conservation.

In order to address these objectives, Dr Robertson's team:

- Carried out a botanical survey to describe the vegetation communities and their condition;
- Carried out a fauna survey for the detection and assessment of fauna and their habitats;
- Completed target field surveys for important species as well as (but not limited to) threatened species, populations and ecological communities;
- Undertook suitable mapping of fauna habitat to support the other objectives;
- Assessed the conservation value of the site, particularly in relation to Native Vegetation of the Cumberland Plain Maps (NPWS, 2002)
- Prepared an ecological assessment in accordance with the requirements of the Environment Protection and Biodiversity Conservation Act (EPBC Act (1999), the Threatened Species Conservation Act (TSC Act) (1995), the Native Vegetation Conservation Act (NVC Act) (1997), the Fisheries Management Act (1994) and guidelines issued by the National Parks and Wildlife Service
- Outlined management requirements to ensure the conservation / restoration of the ecological values of relevant parts of the study area.

South Coast Sensitive Urban Lands Review – Experts Panel

This project involved independent review (for the Department of Planning in 2006) of planning and ecological issues concerning 17 sites zoned for urban development in the South Coast region (within Shoalhaven, Eurobodalla and Bega Valley LGAs) identified as being environmentally sensitive in the Draft South Coast Regional Strategy.

Following the release of the draft Strategy in May 2006, the Minister for Planning appointed an independent Expert Panel to investigate and report on the sensitive sites outlined in the strategy. Dr David Robertson was selected as a member of the Expert Panel.

Specifically, the Panel was required to determine the suitability and scale of any release for urban development within the sensitive sites. This involved review of written submissions, attendance at public hearings and provision of recommendations for each of the sites according to best planning and ecological outcomes. It also required intensive workshopping with local councils and other agencies such as National Parks and Wildlife and the Department of the Environment and Conservation.

Emirates Hotels – Wolgan Valley Resort

Dr Robertson was commissioned by Emirates Hotels to submit a Public Environment Report to fully assess the impacts of the proposed construction and operation of the Emirates Wolgan Valley Resort upon matters protected under the Commonwealth Environment Protection and Biodiversity Conservation Act.

This involved assessing a wealth of available information concerning studies that had already been undertaken of the site (both ecological and otherwise) as well as conducting on-site field investigations to gather further information. Finally, a full assessment of the impacts of the project was produced, including consideration of alternative options, mitigation techniques and long-term management requirements. The report underwent public exhibition and Dr Robertson managed the consultation and review process for this. The project was approved by the Commonwealth government in early 2007.

Dr Robertson's team was also commissioned to prepare a Vegetation Management Plan for the 1,000+ ha site to address the ecological rehabilitation of the site and its enhancement for biodiversity. This included assessing the rehabilitation and regeneration requirements of an 8 km stretch of riparian corridor, as well as assessing the potential for reconstructing wildlife corridors across the site for a range of threatened fauna species.

Shannon Creek Monitoring Program

The Clarence Valley and Coffs Harbour Regional Water Supply Project includes construction of a 30,000 megalitre storage at Shannon Creek, southwest of Grafton. The storage development involves the construction of the storage facility and associated infrastructure within the Shannon Creek valley as well as the construction of a new access road and pipeline into the valley and upgrading of the existing connecting local roads.

Under the approval conditions for the construction and operation of the Regional Water Supply, many of the threatened species, communities, vertebrate pests and weeds must be monitored throughout the area. The monitoring program commenced a number of years prior to the start of construction to enable collection of baseline data regarding population levels and distribution of the various species and communities. This includes monitoring in adjacent conservation reserves. The monitoring program is to continue throughout construction of the Regional Water Supply and into its operation. Monitoring of the Brush-tailed Rock wallaby at Shannon Creek has been undertaken during each of these sessions. The Brush-tailed Rock wallaby was monitored at Chambigne Nature Reserve during the first four monitoring sessions and at Koukandowie Nature

The monitoring program assesses a range of impacts which may be associated with the Regional Water Supply, including:

- The impact on macropod populations;
- Clearing of vegetation;
- Infection of native plants by the root-rot fungus Phytophthora cinnamomi;
- The invasion of native plant communities by exotic and perennial grasses; and
- Invasion of vertebrate pests along construction corridors.

The monitoring programme has yielded a large amount of data on most subject species/ communities with the majority of the results indicating continuing occurrence of threatened species and communities at known locations. The environmental impact statement for the Water Supply Project predicted that the Brush-tailed Rock wallaby populations would remain largely unaffected by the construction of the storage. The management measures which will be implemented for the project have the following objectives in regards to the Brush-tailed Rock wallaby:

- Maintain, protecting and/or enhancing habitat; and
- Maintenance of movement corridors.

To achieve the above objectives various management measures have been proposed within the Threatened Species Management Plan including the creation of a movement corridor between escarpments downstream of the dam wall to encourage the movement of Brush-tailed Rock wallaby between the escarpments and nature reserves. The corridor will include grassland, riparian habitat and woodland.

Additional monitoring of this habitat will remain in progress for some years to come, to establish whether control actions are required.

Growth Centres, Kellyville - Biodiversity Assessment Program

North Kellyville forms part of the north-west Growth Centres land release area. The purpose of this project by was to contribute towards the creation of a precinct plan for North Kellyville. The precinct plan was informed by baseline technical studies that included: flora and fauna habitat; bushfire protection; land capability; areas of indigenous and non indigenous significance; flood analysis; and yield analysis.

Key objectives of this project included:

- The provision of a biodiversity assessment that included: a flora and fauna review; an analysis of ecological values and mapping of areas of high, moderate or low ecological value;
- Consideration of the statutory requirements for the protection, restoration and enhancement of threatened species, populations, ecological communities and their habitats;

- Recommended management frameworks for vegetation issues which enable long term conservation and management of these issues while facilitating the development outcomes for the precincts identified in the structure plan;
- Recommended measures to protect biodiversity values within areas identified by the Growth Centres SEPP; and
- Recommendations to ensure that precinct planning is consistent with the terms of any biodiversity certification granted to the SEPP.

SAN Hospital Wahroonga - Biodiversity Assessment and Biodiversity Management Plan

Dr Robertson has carried out numerous surveys in the Wahroonga area in the past, and he was requested to investigate the ecological values of the subject land for a Part 3A Application.

The bushland on the subject site contains significant ecological development constraints. The vegetation contains the endangered ecological communities Turpentine Ironbark Forest and Blue Gum High Forest, as waee as a suspected nesting location of the Powerful Owl. Additionally, the bushland on the site forms part of wildlife corridors with significant links to other habitat in the locality, particularly Land Cove National Park.

As a result of the sensitivity of the area, it was necessary to conduct up-to-date surveys, and assess the findings of numerous past reports in the light of this current survey data. After lengthy consultation with local council and government departments, it was decided that a Biodiversity Management Plan was required to ensure the progress of the development, as well the preservation of the site's sensitive ecological issues.

Belconnen Naval Transmitter Station – Macropod Management

Under great pressure Dr Robertson successfully completed this sensitive and highly scrutinized kangaroo population management project at the former Belconnen Naval Transmitter Station in Canberra in May 2008.

The project was undertaken to alleviate the extreme kangaroo grazing pressure on the Commonwealth listed Endangered Ecological Community, Natural Temperate Grasslands (NTG) that occur throughout the site.

Dr Robertson and his team drafted a management plan for the site and then designed and implemented the cull. Culling by shooting was not permitted by the ACT police, necessitating a cull by darting and lethal injection. The cull entailed fencing the site with over 1 km of temporary fencing, herding the 600 kangaroos into a holding paddock, then a large capture yard, small capture yard and finally a darting yard.

Dr Robertson managed a team of 24 staff, and up to 24 additional herders, under constant media and public scrutiny to achieve a major reduction in the kangaroo population from 600 kangaroos (not including pouched young) to approximately 100 animals.

He successfully consulted with a wide range of stakeholders for this project including senior Defence staff, Spotless staff, Environment ACT, RSPCA, senior research scientists, and others.

The result was that the kangaroo density has been reduced from more than 6 per hectare to approximately 1 per hectare, the threat of starvation has receded and the Natural Temperate Grasslands have undergone a significant recovery.

Dr Robertson and his team have continued to work on kangaroos on BNTS and other ACT Defence sites since the work was undertaken and has recently completed a minor "mopping up" exercise, free range darting 30 additional kangaroos that were not sterilized in the May work.

Consultation took place with stakeholders and parties concerned in the welfare of the kangaroos at BNTS. The consulted parties included: Defence, Environment ACT, animal welfare groups, residents action groups, kangaroo

academic experts and NTG academic experts to determine the most appropriate action for the captive population of kangaroos at BNTS. Translocation of the kangaroos proved to be inappropriate logistically and economically; therefore population reduction activities commenced. Using a method, which at the time was unproven, kangaroos were herded into yards, tranquilised via a dart gun and euthanased via lethal injection. The method proved to be effective, economical and complied with all animal welfare requirements.

The heavy public and media scrutiny of the project provided added difficulties to an already complex project (refer to Photographs 2.2 and 2.3). The site was constantly monitored by media and protestors providing a stressful working environment. A large security presence was engaged and managed by Dr Robertson to monitor; and prevent protestors from entering the site.

Cooranbong Haul Road

This project entailed the provision of fauna survey and management services that were required to support the construction of a haul road linking Mandalong Mine to Newstan Rail Loading Facility.

The client required a Fauna Habitat and Movement Requirements Report assessing the likely impacts of the haul road on fauna and habitat connectivity. The report was prepared prior to construction of the haul road as a condition of consent for the approval of the road. After the survey, Dr Robertson was able to recommend mitigation measures, such as:

- Realignment of proposed routes to avoid significant habitat features
- Pre-clearance surveys to relocate fauna prior to construction
- Road signage and fauna fencing to reduce roadkill
- Erosion control measures
- Fauna underpass and over pass locations
- Revegetation of selected areas and
- Ongoing monitoring.

This project called for extensive communication with the client and local council.

Dr Robertson also assisted in the preparation of an EPBC Referral of Proposed Action due to the presence of threatened flora along the road alignment.

Mannering Colliery

Dr Robertson and his team were required to carry out an investigation of the ecological significance of mine water discharged from the mine into an unnamed creek and wetland between the mine site and it's discharge point into Lake Macquarie. The purpose was to determine the extent to which native flora and fauna are impacted by and/or dependent upon mine water discharge from the mine..Tthere was potential for threatened and regionally significant flora and fauna to have become dependent upon mine water discharges and to be negatively impacted with any alteration discharge regimes.

Dr Robertson was required to:

- Conduct a baseline terrestrial and aquatic ecological survey to determine the current ecological conditions and values;
- Review historical literature and aerial photography to identify ecological conditions prior to mine water discharge in the study area;
- Identify the impacts of Mannering Colliery on the creek during its operations since the 1960s; and
- Predict the types of changes ecologically that would occur in the study area on cessation of the mine water discharge.

This project required extensive and ongoing consultation between Dr Robertson and various government departments, both at a local and state level.

Mount Pleasant Mine

Dr Robertson was required to carry out a survey and analysis of the presence and condition of Box Gum Woodland in the area of the proposed

development of a mine at Mt Pleasant. This highly degraded site existed largely as derived grassland, and as patches of remnant canopy trees with large areas of the study area considered to be the State and Commonwealth listed Endangered Ecological Community.

Further fauna surveys of the study area revealed that despite the degraded nature of the vegetation, the site provided habitat for a suite of threatened woodland birds and arboreal mammals. Provision of results and advice to the client will allow them to make an informed decision about the future of the proposed mining project.

Kapooka Military Area (KMA) and Latchford Barracks (LB)

Dr Robertson and his team have been requested by the Department of Defence via Spotless Services to produce Landscape Management Plans and Kangaroo Management Sub-plans for Kapooka Military Area (KMA) and Latchford Barracks (LB) that will seek to maintain and enhance matters of environmental significance, while sustaining Defence's military capacity on the site.

Kapooka Military Area (KMA) is a relatively large site that covers an area of nearly 2000ha and is located 9.5km south west of Wagga Wagga. Land uses surrounding the KMA include rural residential housing, rural freehold land and Crown Reserve. KMA land is not fenced with kangaroo proof fencing and is likely to retain a kangaroo population in the long term.

Latchford Barracks (LB) is a small site covering an area of 175ha that has recently been fenced with security fencing, which to a large degree has isolated a small population of kangaroos. Kangaroo numbers have the potential to increase rapidly at LB if unmanaged. Active management is essential and a decision needs to be made about whether or not to retain kangaroos in the longer term, and how they are actively managed.

The overall project requires a separate landscape management plan for both the KMA and LB sites, which strikes a balance between conserving the environmental values (particularly within the Valued Environmental Components) while maintaining military capacity.

The development of a Kangaroo Management Sub Plan (KMSP) for each of the sites to prescribe management strategies to maintain desirable kangaroo densities such that the impacts to environmental values and military capacity are minimised.

We recognise that the integrated LMPs will form an integral part of Defence's Environmental Management Systems (EMS) for each site. The development of the management plans will assist Defence in fulfilling legal obligations under the EPBC Act. These obligations are of particular importance in areas containing threatened species, populations or ecological communities.

Lowes Creek Precinct

Dr Robertson was contracted by the Lowes Creek Consortium to provide an assessment of the ecological values of the Lowes Creek study area in western Sydney and related constraints and opportunities for development. This area is part of the South West Growth Centre identified for investigation. The study area is approximately 896 hectares in size. The purpose of the project was to provide an assessment of the ecological values of the site against the assessments as presented in the Growth Centres Commission Conservation Plan and provide a discussion of ecological constraints to development.

Background studies undertaken on the site and any relevant documents pertaining to the study area were reviewed. A database search for threatened species records in the locality was undertaken to help assess the likelihood that threatened species or communities could occur on the study area.

A number of visits to the study area were made in March and August 2007 to investigate the flora, fauna and ecological constraints of the area. Surveys involved ground-truthing of mapping,

bushfire assessments and flora and fauna surveys (particularly birds, frogs and bats).

Elizabeth Drive, Kemps Creek

The requirement of this project by was to document the findings of a threatened flora assessment of Gazcorp's property at Elizabeth Drive, Kemps Creek and to discuss the implications of this assessment in terms of the development potential of the non-flood affected portion of the property. This report was submitted to the Growth Centres Commission as additional information to an earlier submission, in response to the exhibited Draft Growth Centres Conservation Plan.

As part of the threatened species assessment, Dr Robertson was required to:

- Determine whether any threatened flora species occurred on the non-flood affected portion of the subject site;
- Assess the likelihood of occurrence of threatened species on the subject site; and
- Map areas where potential ecological constraints occurred.

Publications

Robertson, D.J. (1983) Vegetation management towards native mammal reintroduction at Gellibrand Hill State Park. Royal Australian Institute of Parks and Recreation 56 th National Conference Proceedings. 167/1-12.

Robertson, D.J. and Nannestad, C. editors.(1994) Proceedings of the forum on European Carp. Wagga Wagga, NSW. Murrumbidgee Catchment Management Committee.

Wark, M.C., White, M.D., Robertson, D.J. and Marriot, P.F.(1987). Regeneration of heath and heath woodland in the North Eastern Otway Ranges following the wildfire of February 1983. Proceedings of the Royal Society of Victoria 99(2): 51-88.

Wilson, B.A. and Robertson, D.J.(1990) Factors affecting small mammal distribution and abundance in the Eastern Otways. Proc. Ecol. Soc. Aust. 39(2):35-40

Holdway, D. A., Barry, M.J., Logan, D, Robertson D.J. (1994) Acute toxicity of pulse-exposed fenvalerate and esfenvalerate to larval crimson-spotted rainbow fish (Melanotaenia fluviatilis). Aquatic Toxicology

Robertson, A.I., King, A.J., Healey, M.R., Robertson, D.J. and Helliwell, S (1995). The impact of carp on billabongs. A report prepared for the Environment Protection Authority, NSW, Riverina Region.

Conference Papers

Robertson, D.J. (1983) Vegetation management towards native mammal reintroduction at Gellibrand Hill State Park. Royal Australian Institute of Parks and Recreation 56 th National Conference Latrobe University.

Robertson, D.J.(1991) Macrobenthic communities in four billabongs of the Murrumbidgee River: seasonal changes versus water quality. Australian Society for Limnology, Lorne.

Murray, P and Robertson D (1993) Methods for rapid assessment of macroinvertebrate communities using multivariate analysis. Australian Society for Limnology, Calloundra.

Hardwick L, Robertson D and Hillman T (1995) The relationship between macroinvertebrate communities and riparian vegetation in Tarcutta Creek, a lowland tributary of the Murrumbidgee River, NSW..

Tim Playford

Senior Ecologist / Project Manager

Tim Playford is a senior ecologist at Cumberland Ecology with over nine years' experience in ecological consultancy.

Tim currently manages the Brisbane office of Cumberland Ecology and manages a wide range of projects including terrestrial and aquatic flora and fauna impact assessments, monitoring and management plans and land use strategies. He is currently involved with several large scale coal mining projects in the Galilee Basin and Bowen Basin in northern Queensland.

Tim has also managed major projects throughout NSW, including the Hunter Valley, North Coast and Sydney Basin regions. Recently Tim managed the flora and fauna impact assessment of a proposed copper/gold mine in Mindanao Island, the Philippines, which involved managing seven teams of local ecologists over a period of nearly three years. The study area was over 9,500 ha in size, and if it gains approval, this will be the biggest Copper/Gold mine in the southern hemisphere.

Other consultancy work has included:

- Preparation of strategic plans of land release areas, contributing towards precinct planning and rezoning processes;
- Preparation of biodiversity management plans for endangered ecological communities, weeds and feral animals;
- Liaison with State and Federal government agencies; and
- Development of kangaroo culling procedures at Belconnen, ACT.

Fields of Competence

- Knowledge of threatened flora and fauna of Queensland and NSW and appropriate surveying methods for these species.
- Knowledge of relevant environmental legislation, including the Commonwealth EPBC Act 1999, the NSW EP&A Act 1979 and TSC Act 1995, and the Queensland NC Act 1992 and VM Act 1999.
- Understanding of current expectations regarding impact mitigation and biodiversity offset procedures.
- Biodiversity issues, flora and fauna field surveys, biological monitoring and environmental impact assessment.
- Preparation of complex documents involving a high level of research, critical analysis and presentation.
- Experience with liaison with government departments, clients and the community.

Key Industry Sectors

- Mining industry;
- Small industrial; and
- Urban development

Education

Bachelor of Science (Hons) Ecology, University of Adelaide, 2004

Bachelor of Environmental Management, Flinders University of South Australia, 2003

Key Projects

- Tampakan Copper/Gold Project (Phillipines)
- Mt Pleasant Coal Mine (Hunter Valley, NSW);
- North Kellyville Growth Centres (NSW)
- Belconnen Kangaroo Management Plan (ACT).

Vanessa Orsborn

Project Manager / Ecologist

Vanessa Orsborn has worked as a Project Manager and Ecologist for more than eight years and has excellent communication skills and relations with clients and government bodies. Vanessa primarily manages flora and fauna assessments and related Section 5A and State Significant Project assessments under the EP&A Act as well as assessments under the EPBC Act.

Fields of Competence

- Commonwealth and State environmental legislation,
- Ecological survey and monitoring, particularly assessment of threatened species and ecological communities,
- Report writing and liaison with government departments.

Key Industry Sectors

- Urban development
- Natural Resource Management
- Power & Renewable Energies

Education

Bachelor of Environmental Science. Australian Catholic University 2004.

Key Projects

Coal Mine Consent Modification Projects

Since 2010, Vanessa has managed the ecological assessments for several Major Project applications for various coal mines in the Upper Hunter Valley, including Muswellbrook Coal, Bengalla Mine and Mount Pleasant project. Assessments have included consideration of offset requirements, particularly in relation to Box Gum Woodland and other vegetation communities listed under the TSC Act and EPBC Act. Each project has involved extensive negotiation with government authorities in relation to biodiversity offsets.

Ravensworth Mine Complex, Biodiversity Offset Management Programme - Xstrata Coal

Vanessa is currently managing the preparation of a management programme for four biodiversity offset properties acquired by Xstrata to offset the impacts of the Ravensworth Mine Complex. The comprehensive management programme establishes baseline monitoring data and addresses the requirements for conservation management, including weed and pest animal control, erosion management, bushfire management, rehabilitation and future monitoring.

M2 Upgrade – Leighton Contractors

Vanessa has managed the ecological works for the post approval and (current) construction phases of the M2 Upgrade Project. Vanessa has prepared extensive documentation to satisfy approval conditions including mitigation and offset strategies. During construction, she has led a team of ecologists to ensure the safe handling of fauna disturbed during clearing procedures.

St Marys Development – Lend Lease

Vanessa has been involved with the progressive development of the former ADI site at St Marys, Western Sydney for more than six years. This has included preparation of ecological impact assessments and Precinct Planning documents. Recent assessments have included the preparation of large scale Species Impact Statements for the Western Precinct DA's.

Emirates Wolgan Valley Resort & Spa

Vanessa project managed the EPBC Act assessment process for Emirates Wolgan Valley Resort, Lithgow. This involved the production of a Public Environment Report including extensive government consultation. Post construction, she prepared an Operations Manual which outlined all environmental works, monitoring and reporting requirements, while demonstrating compliance with Consent Conditions.

Katrina Wolf

Senior Project Manager / Ecologist

Katrina Wolf is a Senior Project Manager/Ecologist at Cumberland Ecology, based in Sydney. She has a Bachelor of Science (Environmental) with majors in Environmental Science and Biology (Ecology).

Katrina has been involved in flora and fauna surveys, impact assessment, ecological monitoring and GIS. Recently, she has managed several State Significant Developments and Section 5A assessments with endangered ecological community, threatened species and offsetting issues. Katrina has experience in designing and implementing targeted threatened flora and fauna surveys.

Recent consultancy work has included:

- Flora and fauna impact assessments for State Significant Developments;
- BioBanking Assessments on both development and offset sites;
- Development of vegetation management plans; and
- Preparation of offset principles and guidelines for major projects.

Fields of Competence

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999;*
- NSW *Threatened Species Conservation Act 1995;*
- NSW *Environmental Planning and Assessment Act 1979;*
- BioBanking Assessments;
- Ecological survey and monitoring;
- Report writing; and
- Geospatial Information Systems (GIS).

Key Industry Sectors

- Extraction industry; and
- Urban development.

Education

- Bachelor of Science (Environmental). The University of Sydney, 2007
- BioBanking Assessors Training Course TAFE Ryde

Key Projects

Warkworth Mine

Katrina assisted in the preparation of an Ecological Impact Assessment for the Warkworth Mine Project. She also undertook flora and fauna surveys both within the development area and offset areas. More recently, she has worked on the preparation of a revised ecological assessment of the project, including the BCAM assessment.

Watermark Coal Project

Katrina is currently the Project Manager for the Watermark Coal Project. Her involvement has included consultation with DoE, OEH and Namoi CMA, assistance in the preparation of an Ecological Impact Assessment, MNES Report and Koala Plan of Management, as well as field assessments of potential offset properties.

Bylong Coal Project

Katrina is currently the Project Manager for the Bylong Coal Project. Her involvement has included consultation with DoE and OEH, preparation of an Ecological Impact Assessment, field surveys, and development of the offset package.

Department of Planning Part 3A Offset Guidelines

Katrina worked closely with the Department of Planning to develop a set of offset principles and guidelines for Part 3A projects. Her involvement included consultation with the Department of Planning, background research, attendance at a workshop of experts and document preparation.

Management Plans and Monitoring

Katrina has assisted with the development of several management plans for mining projects in NSW, and has been involved in monitoring programs in western Sydney and the Hunter Valley. Such projects have involved monitoring of vegetation and animal population census.

Cecilia Phu

Senior Project Manager / Botanist

Cecilia Phu is a senior project manager and botanist at Cumberland Ecology based in Sydney. She has a Bachelor of Science (Honours) with a major in Biology.

Cecilia has been involved in numerous ecological impact assessment projects with threatened species or endangered ecological community issues and routinely assesses projects in response to State and Commonwealth threatened species legislation. Her work entails vegetation mapping, targeted survey for threatened species, impact assessment and report preparation. Cecilia manages major ecological impact assessments, biodiversity offsetting and management projects.

Cecilia also has experience in survey design, community and population data analysis (SPSS and ePRIMER) and collection, storage and analysis of geospatial data required to provide key strategic advice to clients and department agencies (CivilCad, MapInfo). Recent consultancy work has included:

- Vegetation mapping;
- Flora and fauna impact assessment;
- Biobanking assessments;
- Development of bushland management plans with focuses on threatened species habitat management, weed control and bush regeneration; and
- Monitoring studies for approved activities.

Fields of Competence

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*;
- NSW *Environmental Planning and Assessment Act 1979*;
- NSW *Threatened Species Conservation Act 1995*;
- Biobanking Assessors Training Course at TAFE Ryde;
- Botanical survey, biological monitoring and environmental impact assessment; and
- Geospatial Information Systems (GIS).

Key Industry Sectors

Urban, industrial and logistics, infrastructure, extraction.

Education

Bachelor of Science, University of Sydney, 2006.

Bachelor of Science (Honours) in Biology, University of Sydney, 2008

Key Projects

Flora and Fauna Impact Assessments

Since 2008, Cecilia has ecological assessments in the Hunter region and the Gunnedah Basin for major mining projects. She has also worked within the Gallilee and Bowen Basins in north Queensland. She has also worked the Sydney Metropolitan area and has particular experience within the Sydney Growth Centres and the Western Sydney Employment Area.

BioBanking Assessments

Cecilia has assessed a number of impacts and offsets for projects using the BioBanking assessment methodology in the Sydney Basin and Hunter Valley regions. Work has included vegetation mapping, flora and fauna surveys and habitat assessments. Data collected during fieldwork was utilised within the BioBanking Credit Calculator.

Management Plans and Monitoring

Cecilia has assisted with the development of management plans for development and offsetting projects in the Sydney, north east NSW and western NSW areas. Such projects have involved monitoring of grazing, vegetation restoration and animal population census.

Other Projects

Cecilia has been involved in terrestrial and aquatic ecology studies for a gold mining project in the Phillippines. She has worked closely with local botanists and zoologists in the Phillippines and was involved in the preparation of the terrestrial ecology and aquatic reports for the Project's international Environmental Impact Statement.

Carl Corden

Ecologist / Zoologist

Carl Corden is an Ecologist/Zoologist at Cumberland Ecology, based in Sydney. He has a Bachelor of Environmental Management (Natural Systems and Wildlife).

Carl has ten years of consultancy experience in NSW and Queensland that has included the preparation of baseline fauna and vegetation surveys, ecological assessments, and fauna and vegetation management plans for numerous industry sectors including residential development, infrastructure and mining projects. His specialist areas of expertise include designing, conducting and managing fauna surveys, fauna management protocols and habitat assessment projects.

Carl has conducted numerous fauna surveys and assessments in the arid rangelands of south-western and north-western NSW, primarily for the extractive industries. These projects were largely assessed as Part 3A major projects. Other projects include surveys in central and northern Queensland for large coal mining projects.

Fields of Competence

- Fauna Survey
- Ecological Assessment Reporting
- Wildlife Ecology and Management
- Vegetation Mapping and Conservation Assessment
- Vegetation Management and Clearing Applications
- Pre-clearing Fauna Management
- Threatened Species Survey, Monitoring and Management

Key Industry Sectors

- Urban development
- Extractive industries
- Linear infrastructure
- Local and State Government

Education

Bachelor of Environmental Management (Natural Systems and Wildlife), from the University of Queensland, Brisbane

Key Projects

Fauna surveys and ecological assessment within the Sydney Metropolitan Area

Carl has conducted a number of fauna surveys and ecological assessments for various urban development projects within the Sydney Metropolitan Area. Projects/clients include:

- Sydney Water – Fauna surveys and ecological assessment
- M2 Upgrade, Leightons – Fauna surveys, threatened species management and pre-clearing surveys
- St Marys Development, Delfin Lend Lease – Fauna surveys and pre-clearing surveys
- Heathcote Ridge Re-zoning – Fauna surveys and ecological assessment
- DEOH Military facility – Kangaroo monitoring and management

Fauna surveys, assessment and monitoring in the Hunter Valley

Carl has extensive experience designing, conducting and managing fauna surveys, assessments and monitoring programs in the Hunter Valley. In particular this includes addressing threatened fauna issues for projects being considered under various development applications, including Part 3A assessments.

Fauna surveys and assessments in Western NSW

Carl recently managed the Ecological Assessment for the Watermark Coal Project, near Gunnedah, NSW. This project involved assessment, management and monitoring of a range of issues including Koalas and other threatened fauna, Groundwater-dependant Ecosystems and Critically Endangered Ecological Communities.

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Dr ALISON HOWES

PhD Landscape Ecology
BSc (Hons)

CURRICULUM VITAE

EDUCATION

2008–2012**:** **Doctor of Philosophy**

The University of Queensland

School of Geography, Planning and Environmental Management

Project title: Territorial competition by an aggressive species challenges the conservation of eastern Australian woodland avifauna

Project outline

Although protected areas in the form of national parks and private conservation reserves provide great potential in supplying refugia for fragmentation-sensitive species, there are often a number of deleterious influences on biological diversity, reflective of previous and current management practices. In this thesis, I examined the implications of past and present management actions, and the effects of a native and highly aggressive competitor, the Noisy miner (*Manorina melanocephala*). I examined the role of habitat structure, as influenced by feral grazing and prescribed burning regimes, as potential driving factors for Noisy miner abundance within two large protected areas, the privately owned Carnarvon Station Reserve (Bush Heritage Australia) and Mt Moffatt National Park (Carnarvon National Park). By combining several large datasets, I examined how landscape modification and the occurrence of Noisy miners influenced the foraging profiles of the woodland avifauna of eastern Australia and the potential implications for ecological services. Throughout this project, I obtained extensive experience in field surveying, experimental design and data analysis using a variety of statistical methods. I have also developed exceptional skills in report writing, publishing in scientific journals, conference presentations and in communicating research findings with land managers and other scientific professionals and peers.

2006–2008: **Master of Science**

Project title: Maximising woodland bird diversity in Brigalow Belt forests

Australian Centre for Sustainable Catchments,

The University of Southern Queensland, Toowoomba, Qld

(This project was extended into the above mentioned PhD with The University of Queensland)

Final report: Howes, A and Maron, M. 2008. Maximising woodland bird diversity in Brigalow Belt forests (USQ12). Final condensed report for Land and Water Australia. Land & Water Australia, Canberra, ACT.

2003–2004: **Bachelor of Applied Science (Hons)**

The University of New England, Armidale, NSW

Project title: Changes in mammal diversity across a rainforest-woodland ecotone

Project outline:

For this honours thesis, I investigated the change in small mammal assemblages across an environmental gradient and examined the importance of habitat heterogeneity in influencing mammal species richness. Situated in Washpool and Gibraltar Range National Park, northeastern New South Wales, trapping and spotlight surveys were conducted to determine how mammal abundance and richness varied across the changing vegetation types including: sedge swamp, heath, dry eucalypt forest and rainforest, and the sharp ecotonal boundaries between each vegetation type. I identified significant and consistent changes across the vegetation gradient and summarised vital information regarding species ecology and distribution for the region.

2000–2002: **Bachelor of Applied Science, Animal Studies (Wildlife Biology)**

The University of Queensland, Gatton College, QLD

A variety of subjects were studied in this three year degree covering aspects of environmental problem solving, landscape ecology, wildlife management, animal anatomy and physiology, applied community ecology, animal genetics and breeding, wildlife care and husbandry, and microbiology. During this degree I also developed skills in scientific research design, statistical analysis, report writing and seminar delivery.

EMPLOYMENT

Aug 2007–Apr 2008

Employer: University of Southern Queensland (USQ), Faculty of Science

Lecturing/Tutoring/ Exam Marking

- Employment by USQ was on a causal basis to assist in exam marking, tutoring and lecturing in the field of environmental and ecological sciences.

Jan–Feb 2008

Employer: Dr Jerry Maroulis

Australian Centre for Sustainable Catchments, University of Southern Queensland

Research Assistant

Research Project:

To provide consultation and advice to Queensland Farmers Federation regarding the impact of climate change on agricultural industry.

- I Investigated and detailed the critical climate change factors that influence and impact intensive Queensland agricultural output
- Prepared an in-depth literature review highlighting the concerns and research development in climate change and its affect on various agricultural industries
- Provided advice and assisted in preparing the project leaders for consultation with various industry bodies

Jan– Mar 2007

Employer: Dr Martine Maron

Australian Centre for Sustainable Catchments, University of Southern Queensland

Research Assistant

Research Project:

To model current and future foraging habitat for the endangered Red-tailed Black Cockatoo.

- Assisted in the building of a Bayesian Belief Network model to identify changes in suitable Red-tailed Black Cockatoo habitat within Victoria

Jan 2006–Apr 2006

Employer: Desert Channels Queensland

Research Assistant

Research Project:

To report the effects of artificial watering points on rangeland systems and their biota in Australia.

- Conducted research into the affects of artificial watering points on rangeland biodiversity
- Identified the potential problems of artificial watering points on native fauna and flora species
- Suggested management techniques and directions for future research
- Submitted a final report based on the major findings.

(Howes, A.L and McAlpine, C.A. 2008. The impact of artificial watering points on rangeland biodiversity: A review. DKCRC Working Paper 15, Desert Knowledge CRC, Alice Springs)

Aug 2005–Aug 2006

Employer: Dr Clive McAlpine

School of Geography, planning and Architecture, The University of Queensland

Research Assistant

Research Project:

To model and predict the distribution of the endangered Julia Creek dunnart according to habitat suitability.

- Conducted research into the distribution and ecology of the Julia Creek dunnart
- Developed skills in Bayesian Belief network systems and developed a predictive habitat model for the Julia Creek dunnart
- Assisted in the collection, assembly and analysis of spatial data
- Collected knowledge from experts in a variety of fields relevant to the study
- Partook in the *Ecological Society of Australia conference*, 2005
- Submitted final report to the Environmental Protection Agency summarising the likely distribution of Julia Creek dunnart
- Published findings in *Biological Conservation (2007)*

Sep 2005–Dec 2005

Employer: Dr Jenni Garden

School of Geography, Planning and Architecture, The University of Queensland

Research Assistant for PhD Student

- Assisted in the establishment of field sites and the setting of traps (Elliott, pitfall, cage traps and hair funnels)
- Record keeping including: vegetation assessments, mammal identification, weights, length and individual ID of trapped species
- General field observations, including 'scat and track' identification
- Assisted in the handling and identification of fauna species

Feb 2005–Aug 2005

Australian Koala Foundation, Brisbane, QLD

Volunteer Research Assistant

- Assisted in writing a nomination for listing the Koala as an endangered species under the *Environmental Protection and Biodiversity Conservation Act (1999*)
- Assisted in the research and writing of reports involving the 'Koala Habitat Atlas'
- Helped update internet website pages
- Assisted in field work including 'spot assessments' to determine Koala activity levels
- Involved in a publication in *Wildlife Research (2011)*

2003–2004

Koala Study Program

The University of Queensland, Pinjarra Hills Vet Farm

Volunteer Carer

- Handled and cared for injured Koalas and other fauna species
- Assisted in the general maintenance and cleaning responsibilities involved with animal hospitals
- Assisted in general record keeping including animal weights and health conditions

REFEREED PUBLICATIONS

Howes, A.L., Mac Nally, R., Loyn, R., Kath, J., Bowen, M., McAlpine, C., and Maron, M. (in review). Foraging guild perturbations driven by a despotic species. *IBIS*

Mac Nally, R., Bowen, M., **Howes, A**., McAlpine, C.A., and Maron, M. 2012. Despotic, high impact-species and the subcontinental scale determination of avian assemblage structure. *Ecology* 93: 668–678

Maron, M., Main, A., Bowen, M., **Howes, A**.L., Kath, J., Pillette, C. and McAlpine, C.A. 2011. Relative influence of habitat modification and interspecific competition on woodland bird assemblages in eastern Australia. *Emu* : *Austral Ornithology* 111: 40–51

Callaghan, J., McAlpine, C., Mitchell, D., Thompson, J., Bowen, M., Rhodes, J., de Jong, C., Sternberg, R. and **Scott, A.** 2011. Ranking and mapping koala habitat quality for conservation planning on the basis of indirect evidence of tree-species use: A case study of Noosa Shire, south-eastern Queensland. *Wildlife Research* 38: 89–102

Howes, A.L., Maron, M. and McAlpine, C.A. 2010. Bayesian Networks and Adaptive Management of Wildlife Habitat. *Conservation Biology* 24: 974–983

McAlpine, C.A., Seabrook, L., Rhodes, J.R., Maron, M., Smith, C., Bowen,M., Butler, S., Powell, O., Ryan, J.G., Fyfe, C.T., Adams-Hosking, C., Smith, A., Roberston, A., **Howes, A**., Cattarino, L. 2010. Can a problem-solving approach strengthen landscape ecology's contribution to sustainable landscape planning? *Landscape Ecology* 25: 1155–1168

Howes, A.L. and Maron, M. 2009. Interspecific competition and conservation management of continuous subtropical woodlands. *Wildlife Research* 36: 617–626

Smith, C.S, **Howes, A.L**, Price, B. and McAlpine, C. 2007. Using a Bayesian belief network to predict suitable habitat of an endangered mammal - The Julia Creek dunnart (*Sminthopsis douglasi*). *Biological Conservation* 139: 333–347.

Vernes, K., Green, S., **Howes, A.,** and Dunn, L. 2006. Species Richness and Habitat Associations of Non-flying Mammals in Gibraltar Range National Park. *Proceedings of the Linnaean Society New South Wales* 127: 93–105

CONFERENCE PRESENTATIONS

Howes, A.L and Maron, M. 2007. Woodland Bird Diversity and Noisy miners in Brigalow Belt Forests. *Australian Ornithological Conference, Perth 2007.* – **Awarded Prize for Best Student Presentation**.

Howes, A.L., McAlpine, C. and Lundie-Jenkins, G. 2005. Using Bayesian Belief Network models to develop management strategies for the Julia Creek Dunnart. *Ecological Society of Australia*, *Brisbane 2005*, Poster Presentation

Howes, A.L., Maron, M. and Haseler, M. 2007. *Maximising woodland bird diversity in Brigalow Belt forests. Greening Australia, Veg Futures, Toowoomba 2008*

OTHER PRESENTATIONS

Howes, A.L and Maron, M. 2007. Woodland Bird Diversity and Noisy miners in Brigalow Belt Forests. *Toowoomba Field Naturalist Club, Toowoomba 2008*

Howes, A.L., Maron, M. and Haseler, M. 2007. *Maximising woodland bird diversity in Brigalow Belt forests. Land & Water Australia, Native Vegetation Program, Brisbane 2008*

REFEREES

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Bush Heritage Australia

PO Box 329, Flinders Lane,

Melbourne, VIC 8009 Australia

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Email: murray@bushheritage.org.au

Will provide reference upon request

Dr Clive McAlpine- Senior Research Fellow

Centre for Remote Sensing and Spatial Information Science

School of Geography, Planning and Environmental Management

The University of Queensland

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Will provide reference upon request

Appendix F

Threatened Flora and Fauna Species Survey Requirements and Survey Compliance

Table F.1 Threatened Flora and Fauna Species Survey Requirements and Survey Compliance

Species Name	Conservation Status[1]		Survey Requirements/Techniques	Survey Effort
	EPBC Act	NC Act		
FAUNA				
Reptiles				
Yakka Skink (*Egernia rugosa*)	Vulnerable	Vulnerable	Actively searching suitable open forest, woodland and scrub habitats for potential colony sites and deploying well-shaded Elliott A traps close to burrow entrances. Searching for burrow systems and communal defecation-sites is the most reliable method of detection (SEWPaC, 2011b). The Yakka Skink can be confirmed by Elliott trapping around the burrows, by distant observation with binoculars or by shining a torch down burrows at night (SEWPaC, 2011b). The minimum survey effort required includes a minimum of three survey days and nights and at least one replicate survey (DotE 2014).	Active searches for reptiles were conducted at 61 locations in the study area, for approximately 44 person hours over three survey periods (**Table 3.3**), in which searches were made for colony sites, burrow systems and communal defecation sites. A total of 1,320 Elliott A trap nights in 15 survey locations over three survey periods (**Table 3.3**). In addition, extensive fauna surveys have been conducted for the approved CCM&RP, including targeted searches for this species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area.
Ornamental Snake (*Denisonia maculata*)	Vulnerable	Vulnerable	Active searching in and around suitable gilgai habitats especially during warm evenings following rain (SEWPaC, 2011b). The minimum survey effort required includes a minimum of three survey days and nights and at least one replicate survey (DotE 2014).	Active searches for reptiles were conducted at 61 locations in the study area, for approximately 44 person hours over three survey periods (**Table 3.3**). No gilgai habitat is present in the study area, and thus this habitat type was not searched. There were a total of 1,320 Elliott trap nights in nine survey locations over three survey periods (**Table 3.3**). In addition, extensive fauna surveys have been conducted for the approved CCM&RP, including targeted searches for this

Species Name	Conservation Status[1]		Survey Requirements/Techniques	Survey Effort
	EPBC Act	NC Act		
				species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area.
Birds				
Red Goshawk (*Erythrotriorchis radiatus*)	Vulnerable	Endangered	Search for their characteristic nests within patches of the tallest forest. For inland sites ground searches should be undertaken along river banks for nests within the tallest trees (DEWHA, 2010a). Driving slowly through tropical woodland tracks and scanning groups of tall trees for nests can also be effective. Recommended survey effort is 50 hours over 8 days for an area of 50 ha. The use of a vehicle may be warranted for larger areas (DEWHA, 2010a).	Bird surveys were undertaken at a total of 65 locations, for a total of approximately 37 hours, over three survey periods (**Table 3.3**). The field survey targeted areas of potential habitat for this species such as woodlands. In addition, extensive fauna surveys have been conducted for the approved CCM&RP, including targeted searches for this species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area.
Squatter Pigeon (southern subspecies) (*Geophaps scripta scripta*)	Vulnerable	Vulnerable	Area searches or transect surveys in suitable habitat. Flushing surveys also likely to be useful (DEWHA, 2010a). 15 hours of area searches or transect surveys over 3 days. 10 hours of flushing surveys over 3 days. The above survey effort is for an area of 50 ha. Some adjustment may need to be made for larger areas with consideration given to landforms and vegetation	Bird surveys were undertaken at a total of 65 locations, for a total of approximately 37 hours, over three survey periods (**Table 3.3**). Remnant pool camera traps were undertaken for a total of 40 nights (**Table 3.3**). The field survey targeted areas of potential habitat for this species such as woodlands with a grassy understorey. Flushing was not undertaken as the species was recorded at several locations throughout the study area. In addition, extensive fauna surveys have been conducted for

Species Name	Conservation Status[1]		Survey Requirements/Techniques	Survey Effort
	EPBC Act	NC Act		
			present (DEWHA, 2010a).	the approved CCM&RP, including targeted searches for this species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area.
Star Finch (eastern subspecies) (*Neochmia ruficauda ruficauda*)	Endangered	Endangered	Area searches or transect-point surveys in suitable habitat. Also check within flocks of other finches. Detection by calls and sighting (DEWHA, 2010a). Broadcast (playback) surveys may be useful, especially in the morning and evening. Targeted searches and subsequent watches of waterholes may also be useful in the dry season (DEWHA, 2010a). The recommended survey effort for 50 ha is: a total of 15 hours area searches or transect-point surveys over 5 days; 15 hours broadcast surveys over 3 days (in areas less than 50 ha); and 10 hours of targeted survey of waterholes over 4 days (DEWHA, 2010a).	Bird surveys were undertaken at a total of 65 locations, for a total of approximately 37 hours, over three survey periods (**Table 3.3**). The field survey targeted areas of potential habitat for this species such as woodlands with a grassy understorey. In addition, extensive fauna surveys have been conducted for the approved CCM&RP, including targeted searches for this species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area.
Black-throated Finch (white-rumped subspecies) (*Poephila cincta cincta*)	Endangered	Endangered	Actions proposed in grassland or grassy woodland within five km of a recent (post-1995) Black throated finch (white-rumped subspecies) record will require habitat assessment. Where suitable habitat exists, the subspecies should be presumed to be present. Surveys for the Black-throated finch (white-rumped subspecies) are therefore not essential in these areas, but can be useful.	Bird surveys were undertaken at a total of 65 locations, for a total of approximately 37 hours, over three survey periods (**Table 3.3**). Remnant pool camera traps were undertaken for a total of 40 nights (**Table 3.3**). The field survey targeted areas of potential habitat for this species such as woodlands with a grassy understorey. In addition, extensive fauna surveys have been conducted for the approved CCM&RP, including targeted searches for this

Species Name	Conservation Status[1]		Survey Requirements/Techniques	Survey Effort
	EPBC Act	NC Act		
			In the tropics, locate and watch suitable waterholes late in the dry season and conduct area searches of Savannah woodland (DEWHA, 2010a). Also check around breeding Black-faced Woodswallow (*Artamus cinereus*) flocks in the early wet season. Elsewhere use area searches of suitable habitat for sightings and checking flocks of other finch species (DEWHA, 2010a). Recommended survey effort includes land-based area searches of areas less than 50 ha for 10 hours over 5 days; and targeted searches of waterbodies and Black-faced Woodswallow nests for 6 hours over 2 days (DEWHA, 2010a). Surveys should be undertaken during the breeding season which typically occurs from February to May (DotE, 2014v).	species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area. No Black-faced Woodswallow nests were recorded and therefore none could be surveyed (as per the guidelines). Surveys were undertaken during the wet season in May 2012.
Australian Painted Snipe (*Rostratula australis*)	Endangered	Endangered	Area searches or transects through suitable wetlands; detection by sighting and flushing. Targeted stationary observations at dawn and dusk of suitable foraging locations within wetlands; detection by sighting (DEWHA, 2010a). Also a brief spotlight search shortly after dusk may detect birds. The recommended survey effort is (DEWHA, 2010a): a total of 10 hours over 5 days of targeted stationary	Bird surveys were undertaken at a total of 65 locations, for a total of approximately 37 hours, over three survey periods (**Table 3.3**). Remnant pool camera traps were undertaken for a total of 40 nights (**Table 3.3**). Spotlighting was also undertaken at 15 locations for a total of 15 person hours (**Table 3.3**). The field survey targeted areas of potential habitat for this species such as woodlands with a grassy understorey. In addition, extensive fauna surveys have been conducted for

Species Name	Conservation Status[1]		Survey Requirements/Techniques	Survey Effort
	EPBC Act	NC Act		
			observations; and 10 hours over 3 days of land based area searches or line transects (for wetlands <50 ha).	the approved CCM&RP, including targeted searches for this species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area.
Mammals				
Greater Bilby (*Macrotis lagotis*)	Vulnerable	Endangered	The following survey techniques are recommended to detect the presence of the Greater Bilby in areas up to 5 ha in size (SEWPaC, 2011a): daytime searches for potentially suitable habitat resources, such as hummock grassland in arid regions, daytime searches for signs of activity, including burrows, tracks, scats and diggings, collection of predator scats, owl casts or remains, targeting predatory bird/mammal nests/dens, and soil plot surveys. It should be noted that the study area is greater than 5 ha in size, and therefore proportionately more survey effort was undertaken.	Active searches were conducted at 61 locations in the study area, for approximately 44 person hours over three survey periods. Habitat assessments were conducted at each active search location including searches for potentially suitable habitat resources and signs of activity. In addition, extensive fauna surveys have been conducted for the approved CCM&RP, including targeted searches for this species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area.
Koala (*Phascolarctos cinereus*)	Vulnerable	Special Least Concern	On-ground Koala surveys should ideally be undertaken between August and January when Koala activity is at a peak (DotE, 2014i). In the inland context, there may be seasonal differences in the use of habitat and it is recommended that Koala surveys that are conducted during dry periods should be centred on riparian areas, upper/mid-slope areas and	Field surveys were undertaken during appropriate times of year (between August and January) in areas of suitable habitat (i.e. riparian woodlands and Eucalyptus woodlands adjacent ephemeral drainage lines). Nocturnal spotlighting was conducted in 15 locations for a total of 15 person hours in the study area. IR camera traps were undertaken at 17 locations for a total of 76 trap nights

Species Name	Conservation Status[1]		Survey Requirements/Techniques	Survey Effort
	EPBC Act	NC Act		
			other potential dry-period refugia (DotE, 2014i). Faecal pellet searches, for example the Spot Assessment Technique developed by Phillips and Callaghan or the Regularised Grid-based Spot Assessment Technique, are recommended to determine the occurrence of Koalas indirectly (DotE, 2014i) . Diurnal searching of strip transects is recommended for areas < 30 ha and where the number of Koalas is expected to be high (DotE, 2014i). Other techniques include: nocturnal spotlighting, call playback, and remote sensor activated cameras (DotE, 2014i).	(**Table 3.3**). In addition, extensive fauna surveys have been conducted for the approved CCM&RP, including targeted searches for this species, as listed in **Appendix D**. This information was reviewed for this project and used to determine suitable habitat for this species and its likelihood of occurrence in the study area.
FLORA				
Salt Pipwort (*Eriocaulon carsonii*)	Endangered	Endangered	No survey requirements have been published for these species.	A total of 77 secondary quadrats and 676 quaternary surveys were undertaken in the study area (**Section 3.2.5**), in which any threatened species found were recorded.
Blue Devil (*Eryngium fontanum*)	Endangered	Endangered		
Hydrocotyle dipleura	-	Vulnerable		
Lawrencia buchananensis	Vulnerable	Vulnerable		
Waxy Cabbage Palm (*Livistona lanuginosa*)	Vulnerable	Vulnerable		

Species Name	Conservation Status[1]		Survey Requirements/Techniques	Survey Effort
	EPBC Act	NC Act		
Myriophyllum artesium	-	Endangered		
Sporobolus pamelae	-	Endangered		

[1] Threatened flora and fauna species status under the EPBC Act (current at 6 March 2015).

Appendix G

Threatened Species Habitat Mapping

For the purposes of impact assessment, habitat modelling and mapping was undertaken for the following threatened fauna species that are known or considered likely to occur in the study area:

- Squatter Pigeon (southern subspecies);
- Black-throated Finch (white-rumped subspecies);
- Australian Painted Snipe;
- Koala; and
- Short-beaked Echidna.

The specific criteria and assumptions used in creating habitat models for these threatened species are presented below.

Squatter Pigeon (southern subspecies)

Habitat modelling for the Squatter Pigeon (southern subspecies) was conducted based on the presence of suitable foraging vegetation habitat and proximity to permanent water as summarised in **Table G.1**. **Figures 15** and **16** show habitat within and surrounding the study area for this species.

Natural foraging habitat for the Squatter Pigeon (southern subspecies) is any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy or gravelly soils, within 3 km of a suitable, permanent or seasonal waterbody (DotE, 2014l). Breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody (DotE, 2014l).

Table G.1 Squatter Pigeon (southern subspecies) Habitat Mapping Criteria

Habitat Analysis Criteria	Explanation
Pre-existing models for threatened species habitat	No habitat models exist. The CCM&RPEIS mapped all areas of forest and woodland as potential habitat for this species, and did not develop more refined modelling techniques. The species forages widely across all open woodland and grassland habitats, and breeding is generally on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent or semi-permanent waterbody (DotE, 2014l).
Threatened species records in the study area	Squatter Pigeon (southern subspecies) has been found in a wide variety of habitats across the study area, but particularly savannah woodlands with a grassy or layered open understorey.
Threatened species records in the locality	The species has been frequently and widely reported from the locality.

Habitat Analysis Criteria	Explanation
RE mapping	All REs that include remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species.
Topography/soils	According to the Species Profile and Threats (SPRAT) database, soil landscapes are a good indicator of where foraging and breeding habitats occur. Well-draining, gravelly, sandy or loamy soils support the open forest, woodland and grassland habitats in which the species forages. These habitats occur extensively in the eastern portion of the study area, and within some portions of the north. Breeding occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody.
Permanent water sources	According to the SPRAT profile, this species must access water daily. Breeding areas, which have been mapped as high value habitat, have been mapped to include areas with suitable REs within 1 km of permanent water.
Presence of preferred food plants	It is estimated that 95% of the Squatter Pigeon's (southern subspecies) diet is based on seeds from low vegetation such as grasses, herbs and shrubs. The species also takes *Acacia* spp. seeds, when available.
Presence of tree hollows	NA.
Foraging distances around permanent water	NA.
Presumed presence of harmful feral species	NA, other than cattle (see below).
Sensitivity to cattle grazing pressure	As the species occurs in largely in open grassy country, feeds largely on seeds and must drink daily from permanent or semi-permanent waters, it is in direct competition with cattle and is likely to be sensitive to grazing pressure. Notwithstanding this, to take a precautionary approach, all permanent waters, regardless of cattle grazing pressure were used for mapping of Squatter Pigeon (southern subspecies) habitat.

Using these descriptions, two habitat categories for the Squatter Pigeon (southern subspecies) have been mapped in the study area and are described below.

High Value Habitat is considered to be potential breeding habitat, and has been mapped to include all areas within 1 km of permanent water. The majority of the vegetation types in the study area are likely to provide suitable habitat for this species (**Section 4.3**), however, it is restricted to being within approximately 1 km of water as it needs to drink daily. Areas of potential high value habitat in the study area are located in the southern part of the study area where lower-lying flat grassy woodland areas with nearby water occur and in the northern-central upland areas of the study area where similar habitats are present.

For the purposes of this modelling "permanent water" was taken to include areas that were recorded as containing water during field surveys in October 2012 and/or October 2013. October is towards the end of the dry season and shortly before the onset of the wet season in the Desert Uplands, and therefore any remnant pools that were recorded during the October surveys have been considered in this assessment to be relatively permanent. These remnant pools would however, dry up during an extended drought, given that they are reliant on surface water. However it is also possible that additional pools would contain water in October during wetter years.

Low Value Habitat is habitat that generally comprises foraging areas that occur throughout most of the study area. It comprises all areas of woodland dominated by trees of the genera *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species.

No unsuitable habitat for this species has been mapped within the study area.

Areas of habitat for this species within and surrounding the study area are presented on **Figures 15** and **16**.

Figure 15 indicates that approximately 3,440 ha of high value habitat for this species is present in the study area and approximately 16,643.4 ha of low value habitat for this species is present in the study area.

Black-throated Finch (white-rumped species)

Habitat modelling for the Black-throated Finch (white-rumped subspecies) included consideration of RE mapping, known records and proximity to water as shown in **Table G.2**.

Table G.2 Black-throated Finch (white-rumped subspecies) Habitat Mapping Criteria

Habitat Analysis Criteria	Explanation
Pre-existing models for threatened species habitat	Habitat modelling methodology conducted for the Black-throated Finch (white-rumped subspecies) by GHD for the CCM&RP (GHD, 2014a).
Threatened species records in the study area	The Black-throated Finch (white-rumped subspecies) has been detected in small flocks at and nearby several of the fauna trap sites in the eastern portion of the study area, largely within savannah woodland in close proximity to permanent or semi-permanent water.
Threatened species records in the locality	The Black-throated Finch (white-rumped subspecies) has been recorded several times within the nearby proposed Carmichael Coal Mine site (GHD, 2014a).
RE mapping	The following REs are REs where this species has been recorded in the Desert Uplands Bioregion (**Figure 3**) as listed in the National Recovery Plan (Black-throated Finch Recovery Team, 2007). The list of REs from the National Recovery Plan (Black-throated Finch Recovery Team, 2007) that are present in the study area have been marked with an asterisk (*):

Habitat Analysis Criteria	Explanation
	➢ *10.3.6: *Eucalyptus brownii* open-woodland on alluvial plains; ➢ 10.3.9: *Eucalyptus whitei* open-woodland on sandy alluvial fans; ➢ 10.3.13: *Melaleuca fluviatilis* and/or *Eucalyptus camaldulensis* woodland along watercourses; ➢ 10.3.28: *Eucalyptus melanophloia* or *E. crebra* open woodland on sandy alluvial fans; ➢ 10.4.8: *Dichanthium sericeum* and/or *Astrebla* spp. and/or *Panicum laevinode* tussock grassland on Cainozoic lake beds; ➢ *10.5.1: *Eucalyptus similis* and/or *Corymbia brachycarpa* and/or *C. setosa* low open woodland to open woodland on sand plains; ➢ *10.5.5: *Eucalyptus melanophloia* open woodland on sand plains; and ➢ *10.7.11: *Eucalyptus melanophloia* low open-woodland on ferricrete. This list was further expanded to include one additional RE (RE 10.3.28), in which this species was recorded at the proposed Carmichael Coal Mine site. All RE polygons that contained these REs were included, even if they only comprised a component of a mixed polygon.
Topography/soils	Black-throated Finch (white-rumped subspecies) records for the study area are largely confined to the gently undulating sand plains in the east of the study area.
Permanent water sources	Remnant pools exist along an ephemeral drainage line in the north-eastern section of the southern portion of the study area (**Figure 10**).
Presence of preferred food plants	The major published literature about the Black-throated Finch (white-rumped subspecies) indicates that it is a grass seed eating specialist. Grasses are mostly present in the savannah woodland in the southern portion of the study area.
Presence of tree hollows	NA.
Foraging distances around permanent water	Habitat modelling conducted for the CCM&RP (GHD, 2014a) considered that areas within 3 km of permanent water comprised high value habitat for this species.
Presumed presence of harmful feral species	No known feral animals can be used to predict the occurrence of the Black-throated Finch (white-rumped subspecies).
Sensitivity to cattle grazing pressure	Field observations made during fauna surveys for this project indicate that heavy cattle grazing has impacted habitats as cattle graze the grass cover intensively around watering points, which are required by the Black-throated Finch (white-rumped subspecies). Notwithstanding this, to take a precautionary approach, all

Habitat Analysis Criteria	Explanation
	permanent waters, regardless of cattle grazing pressure were used for mapping of Black-throated Finch (white-rumped subspecies) habitat.

Three categories of potential habitat for the Black-throated Finch (white-rumped subspecies) have been identified: high value habitat; low value habitat; and unsuitable habitat and these are described below.

High Value Habitat is calculated based on the following REs (listed in **Table G.2**):

- REs present within the study area that are listed as occurring within the Desert Upland Bioregion (**Figure 3**) in the National Recovery Plan for the Black-throated Finch (Black-throated Finch Recovery Team, 2007); and
- REs where surveys in and adjacent to the study area have consistently recorded the species, and noted them feeding and nesting (GHD, 2013b).

Areas comprising high value habitat for this species are considered to comprise areas within these REs that are within 3 km from permanent water sources, as previously defined. The Black-throated Finch (white-rumped subspecies) has the requirement to drink daily and therefore its foraging range is restricted to the distance that it can fly to water. This species is known to be able to fly up to 3 km daily (DEWHA, 2009) and therefore REs that provide potential habitat for this species and that are within 3 km of permanent water have been mapped as potential high value habitat.

Low Value Habitat is defined as REs where Black-throated Finches (white-rumped subspecies) have been recorded, or are listed in the Recovery Plan (Black-throated Finch Recovery Team, 2007), but are over 3 km from permanent water sources.

Unsuitable Habitat comprises all other areas not classified as high value or low value habitat based on a lack of suitable RE habitat as defined previously.

Areas of habitat for this species within and surrounding the study area are presented on **Figures 17** and **18**.

Figure 17 indicates that approximately 7,065.9 ha of high value habitat, 6,878.8 ha low value habitat and 6,143.2 ha of unsuitable habitat have been mapped for the Black-throated Finch (white-rumped subspecies) within the study area.

Australian Painted Snipe

Habitat modelling for the Australian Painted Snipe has been based on its requirement for wetland habitat. This species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. The approach taken to modelling the habitat of the Australian Painted Snipe is summarised in **Table G.3**.

Table G.3 Australian Painted Snipe Habitat Mapping Criteria

Habitat Analysis Criteria	Explanation
Pre-existing models for threatened species habitat	None available, however the species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (DotE, 2014w).
Threatened species records in the study area	Not detected in the study area, but potential habitat exists.
Threatened species records in the locality	This species was not recorded from database searches of the locality.
RE mapping	NA.
Topography/soils	Relatively flat, poorly drained country.
Permanent water sources	Seasonal wetlands, rather than the remnant pools within ephemeral drainage lines, are more likely to provide suitable habitat for this species, and have thus been mapped as potential high value habitat (**Figure 10**).
Presence of preferred food plants	The Australian Painted Snipe forages on vegetation, seeds, insects, worms and molluscs, crustaceans and other invertebrates (DotE, 2014w). These may occur during inundation of the two seasonal wetlands within the study area (**Figure 10**).
Presence of tree hollows	NA.
Foraging distances around permanent water	The Australian Painted Snipe feeds within well-defined wetland areas, and generally does not forage widely around them.
Presumed presence of harmful feral species	NA for mapping.
Sensitivity to cattle grazing pressure	Field observations made during fieldwork indicate that cattle graze within and probably degrade habitat for this species. However, to take a precautionary approach, the two seasonal wetlands (**Figure 10**), regardless of cattle grazing pressure, were used for mapping of Australian Painted Snipe habitat.

Based on the information in **Table G.3**, two categories of potential habitat for the Australian Painted Snipe have been identified: high value habitat and unsuitable habitat and these are described below.

High Value Habitat comprises the northern and southern seasonal wetlands (**Figure 19**). These areas dry up during the dry season, however there is potential that the Australian Painted Snipe utilises them when they contain water in the wet season.

Unsuitable Habitat comprises the remaining parts of the study area.

Areas of habitat for this species within and surrounding the study area are presented on **Figures 19** and **20.** Habitat modelling for this species indicates that there is approximately 135.2 ha of high value habitat for this species in the study area, comprising the two seasonal wetlands in the study area (**Figure 19**). These areas, when they contain water, contain regions of shallow wetland with areas of bare mud and islands. Important habitat features such as emergent tussock grasses and sedges are present as well as riparian vegetation. Neither of the seasonal wetlands had water remaining during the October survey periods, which indicates that these seasonal wetlands are unlikely to provide important habitat.

The two artificial farm dams still contained water during the late spring survey, however these areas were highly degraded by stock; they had no riparian vegetation or emergent grasses; the water was highly turbid; and the edge boggy from cattle access. Accordingly, these farm dams are unlikely to comprise suitable habitat. Although the ephemeral drainage lines within the study area may contain large remnant pools during the wet season and early dry season, they are not wetlands as such and are unreliable water sources that are unlikely to provide important habitat for this species as they dry out in summer.

Koala

Koala distribution is very strongly correlated with the distribution and abundance of preferred food trees, particularly those within fertile and/or well-watered portions of the landscape. The introduction of disease (*Chlamydia*) and clearing/fragmenting of habitat have also strongly influenced the occurrence of the Koala.

Habitat modelling for the Koala included consideration of known records in the study area, RE mapping, and published information on the habitat preferences of this species. The entirety of the study area is within the distributional range of the Koala.

The approach taken to modelling Koala habitat is presented in **Table G.4**.

Table G.4 Koala Habitat Mapping Criteria

Habitat Analysis Criteria	Explanation
Pre-existing models for threatened species habitat	No formalised model exists for Koala habitat in northern Queensland. The CCM&RP EIS mapped habitat for the Koala in all areas containing open Eucalypt woodland and open Eucalypt forest vegetation fringing watercourses. However, where modelling has occurred, it has been based upon the distribution and abundance of preferred food trees that

Habitat Analysis Criteria	Explanation
	have been verified by scientific study. The most preferred tree species are referred to as "primary food trees", the next most preferred are "secondary food trees". Tree species that are not fed upon, or very rarely browsed, are categorised as "tertiary/unsuitable". The major trees of the study area belonging to the Myrtaceae family (i.e. *Eucalyptus* spp., *Corymbia* spp. and *Melaleuca* spp.) have been subdivided into these categories for the purpose of habitat mapping. **Table G.5** provides further detail on Koala food trees present within the study area.
Threatened species records in the study area	A single Koala was recorded in the study area, within riparian forest dominated by Forest Red Gum in the study area.
Threatened species records in the locality	A single individual of the Koala was recorded from the proposed Carmichael Coal Mine site boundary (GHD, 2013b).
RE mapping	REs have been differentiated based upon whether they comprise primary, secondary or tertiary/unsuitable tree species. **Table G.5** provides further detail on Koala food trees present within the study area.
Topography/soils	Preferred food trees (**Table G.5**) growing on fertile and/or well-watered areas are commonly preferred by the Koala.
Permanent water sources	NA.
Presence of preferred food plants	As described above - habitat modelling is related largely to food trees (**Table G.5**).
Presence of tree hollows	NA.
Foraging distances around permanent water	NA.
Presumed presence of harmful feral species	NA.
Sensitivity to cattle grazing pressure	NA.

The concept of Koala food trees is central to habitat mapping for this species. The *EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (herein referred to as the "EPBC Act Koala Referral Guideline") (DotE, 2014i) defines Koala food trees as: *Species of tree whose leaves are consumed by koalas. Koala food trees can generally be considered to be those of the following genus: Angophora, Corymbia, Eucalyptus, Lophostemon and Melaleuca".* It refers to the following references to identify potential food trees:

- NSW Office of Environment and Heritage koala habitat web page: www.environment.nsw.gov.au/animals/koalahabitat.htm;

- QLD EHP protection koala habitat webpage: www.ehp.qld.gov.au/wildlife/koalas/koala-ecology.html;
- Australian Koala Foundation tree list: www.savethekoala.com/about-koalas/trees-koalas (identifies known food trees by Local Government Area); and
- The New South Wales Recovery Plan for the Koala: www.environment.nsw.gov.au/resources/threatenedspecies/08450krp.pdf

These references have been consulted in identifying Koala food trees. In addition, a recent study conducted by Melzer *et al*. (2014) studied the habitat and diet of the Koala across Queensland. The study concluded that River Red Gum and Coolibah were the most frequently consumed tree species by the Koala in the Desert Upland Bioregion (**Figure 3**) (Melzer *et al*., 2014). In the study area, *Eucalyptus tereticornis* co-occurs with *E. camaldulensis* along the riparian zone of some of the ephemeral drainage lines, including where the Koala was recorded. This species is known to be an important feed tree for Koalas (see NSW Office of Environment and Heritage webpage, referenced above) and therefore it is considered to be an important habitat tree for Koalas in the study area.

For the purposes of habitat modelling, potential Koala food trees recorded within the study area [based on the references cited by DotE (2014i) and Melzer *et al*. 2014] have been grouped into three categories: primary food trees (food trees most preferred by the Koala); secondary food trees (less preferred trees by the Koala but still with the potential for these tree species to be used as a food resource); and tertiary/unpreferred food trees (trees that are not considered likely to provide a food source for the Koala). The primary, secondary and tertiary/unpreferred food trees for the Koala within the study area are listed in **Table G.5**.

Table G.5 Primary, Secondary and Tertiary/Unpreferred Food Trees of the Koala within the Study Area

Scientific Name	Common Name
Primary Food Trees	
Eucalyptus camaldulensis	River Red Gum
Eucalyptus tereticornis	Forest Red Gum
Secondary Food Trees	
Corymbia dallachiana	Dallachy's Gum
Eucalyptus brownii	Reid River Box
Eucalyptus crebra	Narrow Leaved Ironbark
Melaleuca bracteata	Black Tea-tree
Melaleuca nervosa	a Paperbark
Tertiary/Unpreferred Food Trees	
Corymbia brachycarpa	a Bloodwood
Corymbia leichardtii	Yellowjacket

Scientific Name	Common Name
Primary Food Trees	
Corymbia plena	a Bloodwood
Corymbia setosa	Rough-leaved Bloodwood
Eucalyptus exilipes	Fine-leaved Ironbark
Eucalyptus fibrosa	Broad-leaved Ironbark
Eucalyptus lamprophylla	Shiny-leaved Bloodwood
Eucalyptus mediocris	
*Eucalyptus melanophloia**	Silver-leaved Ironbark
Eucalyptus persistens	-
Eucalyptus similis	Inland Yellow Jacket
Eucalyptus spp. mixed specimen	a Mallee Eucalyptus
Melaleuca chisholmii	a Paperbark
Melaleuca minutifolia	-
Melaleuca pallescens	a Paperbark
Melaleuca tamariscina	a Paperbark

* Prominent species consumed east of the Great Dividing Range in the Brigalow Belt Bioregion (**Figure 3**) (Melzer *et al.*, 2014).

According to the EPBC Act Koala Referral Guidelines, habitat critical to the survival of the Koala is habitat that is considered to be important for the species' long-term survival and recovery (DotE, 2014i). An impact area that scores five or more using the habitat assessment tool for the Koala in the Referral Guidelines contains habitat critical to their survival. The habitat assessment tool is to be applied once to the entire impact area of the proposed action.

The habitat assessment tool is reproduced in **Table G.6** with a column showing the ranking of the study area against each attribute. Using the criteria in the DotE Koala habitat assessment tool presented below, the study area receives a score of nine and is therefore considered to contain habitat critical to the survival of the Koala. However, given that the EPBC Act Koala Referral Guidelines are broad and non-selective for the purpose of habitat modelling (i.e. do not reflect that different parts of the study area may provide different habitat value for the Koala), detailed habitat modelling was undertaken based on the field work. The detailed analysis of the relative quality of Koala habitat within the study area indicates that the study area contains areas of high, low and unsuitable habitat for the Koala.

CUMBERLAND ECOLOGY

Table G.6 Koala Habitat Assessment Tool

Attribute	Score	Inland	Project Assessment
Koala occurrence	**2 (high)**	Evidence of one or more Koalas within the last 5 years.	Yes.
	1 (medium)	Evidence of one or more Koalas within 2 km of the edge of the impact area within the last 10 years.	n/a
	0 (low)	None of the above.	n/a
Vegetation composition	**2 (high)**	Has forest, woodland or shrubland with emerging trees with 2 or more known Koala food tree species in the canopy, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	Yes – there are 2 or more Koala food tree species within the Koala habitat within the study area.
	1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known Koala food tree present.	n/a
	0 (low)	None of the above.	n/a
Habitat connectivity	**2 (high)**	Area is part of a contiguous landscape ≥1,000 ha.	Yes –the study area provides more than 1,000 ha of Koala habitat, and it is highly likely that there are extensive areas of habitat adjoining the study area.
	1 (medium)	Area is part of a contiguous landscape <1,000 ha but ≥ 500 ha.	n/a
	0 (low)	None of the above.	n/a
Key existing threats	**2 (high)**	Little or no evidence of Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence. Areas which score 0 for Koala occurrence and have no dog or vehicle threat present.	Yes – no evidence of Koala mortality from vehicle strike or dog attack present.
	1 (medium)	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence, **OR**	n/a

Attribute	Score	Inland	Project Assessment
		Areas which score 0 for Koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for Koala occurrence and have a significant dog or vehicle threat present.	n/a
Recovery value	2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context.	No
	1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context.	Yes – the interim recovery values are: • Protect and conserve the quality and extent of habitat refuges for the persistence of the species during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soil moisture and fertility; and • Maintain the quality, extent and connectivity of large areas of Koala habitat surrounding habitat refuges. There are some riparian environments present within the study area which are highly connected to other suitable habitat, however no areas with reliable soil moisture and fertility are present.
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context.	n/a
Total Score: 9			

Based on the information provided in **Tables G.4** and **G.5**, three habitat categories have been mapped for the Koala, namely high value habitat, low value habitat and unsuitable habitat. These are described in detail below.

High Value Habitat comprises areas containing primary food trees (**Table G.5**) (i.e. River Red Gums and Forest Red Gums), which are known to be preferred food trees for Koalas (OEH, 2014).

Melzer *et al*. (2014) also found that Coolibah was one of the most frequently consumed tree species by the Koala in the Desert Upland Bioregion (**Figure 3**). No Coolibah trees were recorded within the study area. River Red Gums and Forest Red Gums were recorded within the study area along the larger ephemeral drainage lines, which are also likely to provide important refuge habitat in times of drought. High value habitat also includes a 1 km buffer around areas containing River Red Gums and Forest Red Gums.

Low Value Habitat comprises areas of the study area that are dominated by less preferred trees (i.e. secondary food trees listed in **Table G.5**), but still have the potential to be used as a food resource for the Koala. These areas are present in the south-eastern portion of the study area and are dominated by species such as Dallachy's Gum, Reid River Box, and Narrow-leaved Ironbark (see **Table G.5**).

Unsuitable Habitat comprises areas of the study area that contain trees that are not considered likely to provide a food source for the Koala (i.e. tertiary/unpreferred food trees listed in **Table G.5**). Although these areas may be used periodically for dispersal purposes, due to the lack of food trees, they have been mapped as unsuitable habitat.

Potential habitat for the Koala within and surrounding the study area are shown on **Figures 21** and **22**. Approximately 6,877.5 ha of high value habitat, 7,228.8 ha of low value habitat and 5,981.6 ha of unsuitable habitat for the Koala is present within the study area (**Figure 21**).

Short-beaked Echidna

The Short-beaked Echidna can inhabit the majority of habitat types that contain a good supply of food. They inhabit a wide range of terrestrial habitats wherever there are enough ants or termites including: deserts, the rainforest, open forest, bushland, farmland and suburban backyards. In Australia, they are most common in forested areas with abundant, termite-filled, fallen logs (Wildlife Preservation Society of Queensland, 2013). The approach taken to modelling the habitat of the Short-beaked Echidna is summarised in **Table G.7**.

Table G.7 Short-beaked Echidna Habitat Mapping Criteria

Habitat Analysis Criteria	Explanation
Pre-existing models for threatened species habitat	No habitat models for this species exist.
Threatened species records in the study area	This species was recorded from one location in the south-eastern section of the southern portion of the study area within Eucalyptus-dominated woodland.
Threatened species	This species is known to occur in the locality of the study area.

Habitat Analysis Criteria	Explanation
records in the locality	
RE mapping	RE mapping was utilised to identify suitable woodland habitats for the Short-beaked Echidna.
Topography/soils	Steep rocky areas were mapped as low value habitat due to the reduced amount of termite mounds in these areas.
Permanent water sources	This criteria has not been used to map habitat for the Short-beaked Echidna as it is not dependent on permanent water sources and gains water from its food (termites) and dew.
Presence of preferred food plants	NA.
Presence of tree hollows	NA.
Foraging distances around permanent water	NA.
Presumed presence of harmful feral species	The presence of wild dogs in the study area may impact on the Short-beaked Echidna, but this has not been used to map habitat as these species are likely to be distributed throughout the study area.
Sensitivity to cattle grazing pressure	This is not likely to affect the habitat value of the study area for the Short-beaked Echidna and has not been used to map habitat.

Based on the information provided in **Table G.7**, two categories of habitat have been mapped for the Short-beaked Echidna, high value habitat and low value habitat, and are described below.

High Value Habitat comprises most woodland areas on relatively shallow slopes that contain food resources for the Short-beaked Echidna.

Low Value Habitat comprises woodlands on steep rocky escarpments that contain fewer food resources for the Short-beaked Echidna.

Potential habitat for the Short-beaked Echidna within and surrounding the study area are shown on **Figures 23** and **24**. Given that the Short-beaked Echidna can inhabit the majority of habitat types, and presence of termites throughout the study area, the majority of the woodland vegetation has been mapped as potential high value habitat (16,226.2 ha) (**Figure 23**). All of the study area has a similar density of termite mounds and fallen logs, except the steep rocky escarpments in the northern portion of the study area, which have a lower density of termite mounds. Accordingly these areas were mapped as low value habitat (3,861.7 ha) (**Figure 23**). No areas of unsuitable habitat have been mapped for the Short-beaked Echidna (**Figure 23**).

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Appendix H

Assessment of the Likelihood of Occurrence of Threatened and Migratory and/or Marine Species

Table H.1 provides a list of all threatened species that were recorded on-site or within the database search results (**Appendices A** and **B**) and provides an assessment of the potential for the species to occur within the study area.

Threatened species that were recorded or assessed as having a high or moderate potential to occur within the study area are described in much more detail in the main body of the report.

Species regarded as having a low potential to occur within the study area are described in **Tables H.2** to **H.10.**

Table H.1 Assessment of Likelihood of Occurrence of Threatened and Migratory and/or Marine Species

Scientific Name	Common Name	Species Status[1]		EPBC Protected Matters Search[3]	Queensland Wildlife Online Database Search[4]	Distribution and Preferred Habitat	Likelihood of Occurrence
		EPBC Act	NC Act[2]				
FAUNA							
Reptiles							
Egernia rugosa	Yakka Skink	V	V	X	-	Refer to **Table H.2** for a more detailed discussion on the Yakka Skink.	Low
Denisonia maculata	Ornamental Snake	V	V	X	-	Refer to **Table H.3** for a more detailed discussion on the Ornamental Snake.	Low
Acanthophis antarcticus	Common Death Adder	-	NT	-	-	This species occurs in a wide range of habitats including wet and dry Eucalypt forests, grasslands, woodlands and coastal heath. Rock outcrops and ridgelines are often associated with preferable habitat due to the presence of rocks to shelter underneath and bask on; however it also is known to prefer areas with thick leaf litter and	Present

Scientific Name	Common Name	Species Status[1]		EPBC Protected Matters Search[3]	Queensland Wildlife Online Database Search[4]	Distribution and Preferred Habitat	Likelihood of Occurrence
		EPBC Act	NC Act[2]				
						around shrubs and dead woody debris where it can take shelter.	
Birds							
Actitis hypoleucos	Common Sandpiper	Mi, M	-	-	X	Refer to **Table H.4** for a more detailed discussion on the Common Sandpiper.	Low
Anseranas semipalmata	Magpie Goose	M	-	X	-	Refer to **Table H.4** for a more detailed discussion on the Magpie Goose.	Low
Apus pacificus	Fork-tailed Swift	Mi, M	-	X	-	Refer to **Section 4.6.7** for a more detailed discussion on the Fork-tailed Swift.	High
Ardea ibis	Cattle Egret	Mi, M	-	X	-	Refer to **Section 4.6.7** for a more detailed discussion on the Cattle Egret.	High
Ardea modesta	Eastern Great Egret	Mi, M+	-	X	-	Refer to **Section 4.6.7** for a more detailed discussion on the Eastern Great Egret.	Present
Calidris acuminata	Sharp-tailed Sandpiper	Mi	-	-	X	Refer to **Table H.4** for a more detailed discussion on the Sharp-tailed Sandpiper.	Low
Erythrotriorchis radiatus	Red Goshawk	V	E	X	-	Refer to **Table H.5** for a more detailed discussion on the Red Goshawk.	Low
Gallinago hardwickii	Latham's Snipe	Mi, M	-	X	-	Refer to **Section 4.6.7** for a more detailed discussion	Moderate

Scientific Name	Common Name	Species Status[1]		EPBC Protected Matters Search[3]	Queensland Wildlife Online Database Search[4]	Distribution and Preferred Habitat	Likelihood of Occurrence
		EPBC Act	NC Act[2]				
						on Latham's Snipe.	
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	V	V	X	X	Refer to **Section 4.6.6** for a more detailed discussion on the Squatter Pigeon (southern subspecies).	Present
Haliaeetus leucogaster	White-bellied Sea-Eagle	Mi, M	-	X	-	Refer to **Table H.4** for a more detailed discussion on the White-bellied Sea-Eagle.	Low
Hydroprogne caspia	Caspian Tern	Mi	-	-	X	Refer to **Table H.4** for a more detailed discussion on the Caspian Tern.	Low
Merops ornatus	Rainbow Bee-eater	Mi, M	-	X	X	Refer to **Section 4.6.7** for a more detailed discussion on the Rainbow Bee-eater.	Present
Neochmia ruficauda ruficauda	Star Finch (eastern subspecies)	E	E	X	-	Refer to **Table H.6** for a more detailed discussion on the Star Finch (eastern subspecies).	Low
Plegadis falcinellus	Glossy Ibis	Mi, M	-	-	X	Refer to **Table H.4** for a more detailed discussion on the White-bellied Glossy Ibis.	Low
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	E	E	X	X	Refer to **Section 4.6.6** for a more detailed discussion on the Black-throated Finch (white-rumped subspecies).	Present
Rostratula australis	Australian Painted Snipe	E, Mi*,	V	X	-	Refer to **Section 4.6.6** for a more	Moderate

Scientific Name	Common Name	Species Status[1]		EPBC Protected Matters Search[3]	Queensland Wildlife Online Database Search[4]	Distribution and Preferred Habitat	Likelihood of Occurrence
		EPBC Act	NC Act[2]				
		M*				detailed discussion on the Australian Painted Snipe.	
Tringa nebularia	Common Greenshank	Mi, M	-	-	X	Refer to **Table H.4** for a more detailed discussion on the Common Greenshank.	Low
Tringa stagnatilis	Marsh Sandpiper	Mi, M	-	-	X	Refer to **Table H.4** for a more detailed discussion on the Marsh Sandpiper.	Low
Mammals							
Macrotis lagotis	Greater Bilby	V	E	X	-	Refer to **Table H.7** for a more detailed discussion on the Greater Bilby.	Low
Phascolarctos cinereus	Koala	V	SLC	X	X	Refer to **Section 4.6.6** for a more detailed discussion on the Koala.	Present
Tachyglossus aculeatus	Short-beaked Echidna	-	SLC	-	X	Refer to **Section 4.6.9** for a more detailed discussion on the Short-beaked Echidna.	Present
FLORA							
Ammannia robertsii	-	-	E	-	X	Refer to **Section 4.5.2** for a more detailed discussion on *Ammannia robertsii*.	Low
Eriocaulon carsonii	Salt Pipwort	E	E	-	X	Refer to **Section 4.5.1** for a more detailed discussion on the Salt Pipwort.	Low
Eryngium fontanum	Blue Devil	E	E	-	X	Refer to **Section 4.5.1** for a more detailed discussion	Low

Scientific Name	Common Name	Species Status[1]		EPBC Protected Matters Search[3]	Queensland Wildlife Online Database Search[4]	Distribution and Preferred Habitat	Likelihood of Occurrence
		EPBC Act	NC Act[2]				
						on the Blue Devil.	
Hydrocotyle dipleura	-	-	V	-	X	Refer to **Section 4.5.2** for a more detailed discussion on *Hydrocotyle dipleura*.	Low
Lawrencia buchananensis	-	V	V	-	X	Refer to **Table H.8** for a more detailed discussion on *Lawrencia buchananensis*.	Low
Livistona lanuginosa	Waxy Cabbage Palm	V	V	-	X	Refer to **Table H.9** for a more detailed discussion on the Waxy Cabbage Palm.	Low
Myriophyllum artesium	-	-	E	-	X	Refer to **Section 4.5.2** for a more detailed discussion on *Myriophyllum artesium.*	Low
Sporobolus pamelae	-	-	E	-	X	Refer to **Section 4.5.2** for a more detailed discussion on *Sporobolus pamelae*.	Low

[1] *Threatened, migratory and/or marine species status under the NC Act and/or EPBC Act (current at 6 March 2015).*

E = Endangered; V = Vulnerable; Mi = Migratory; M = Marine; NT = Near Threatened; SLC = Special Least Concern (non-migratory).

[2] *Excludes Special Least Concern (migratory) species.*

[3] ***Appendix A**.*

[4] ***Appendix B**.*

\+ *Species listed as a marine species under the EPBC Act as Great Egret (Ardea alba).*

* *Species listed as Threatened under the EPBC Act as Painted Snipe (Rostratula australis) (sensu lato).*

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Table H.2 Assessment of Likelihood of Occurrence – Yakka Skink

Species Overview	The Yakka Skink is listed as Vulnerable under the EPBC Act and NC Act. This species was predicted to occur in the study area the EPBC Act Protected Matters Search (**Appendix A**). The core habitat of this species is within the Mulga Lands or Brigalow Belt South Bioregions (**Figure 3**) (DotE, 2014h). The Yakka Skink is known to occur in open dry sclerophyll forest, woodland and scrub, dominated by Brigalow (*Acacia harpophylla*), Mulga (*Acacia aneura*), Bendee (*Acacia catenulata*), Lancewood (*Acacia shirleyi*), Belah (*Casuarina cristata*), Poplar Box (*Eucalyptus populnea*), Ironbark (*Eucalyptus* spp.) and White Cypress Pine (*Callitris glaucophylla*) (DotE, 2014h). The majority of these tree species, with the exception of Lancewood and Ironbarks (*Eucalyptus* spp.), have not been recorded within the study area. This species is also known to occur in the following landforms: alluvium (river and creek flats), clay pans not associated with current alluvium, old loamy and sandy plains, ironstone jump-ups, undulating country on fine-grained sedimentary rocks and sandstone ranges (DotE, 2014h). The main threat to the Yakka Skink is habitat reduction and degradation (DotE, 2014h). A large portion of habitat for this species has been modified through agricultural and urban development (DotE, 2014h). Other threats include inappropriate roadside management, including road widening and removal of microhabitat, such as rocks, logs, dense leaf litter and fallen bark. Feral animal impacts include predation by Foxes (*Vulpes vulpes*) and Feral Cats and ripping of rabbit warrens.
Potential to Occur in Study Area	The Yakka Skink was not recorded during recent surveys of the study area or surveys associated with the CCM&RP, but was assessed as likely to occur within the proposed Carmichael Coal Mine site. Despite the presence of some broadly suitable habitat in the study area, in the form of old loamy and sandy plains and ironstone jump-ups, as well as the presence of some preferred tree species, this species is considered to have a low potential to occur within the study area due to the absence of core habitat (i.e. the study area is not located within the Mulga Lands or Brigalow Belt South Bioregions [**Figure 3**]), lack of majority of preferred vegetation types and lack of records within the study area.

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Table H.3 Assessment of Likelihood of Occurrence – Ornamental Snake

Species Overview	The Ornamental Snake is listed as Vulnerable under the EPBC Act and NC Act. This species was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**). The Ornamental Snake is considered to be largely confined to the Brigalow Belt Bioregion within the drainage system of the Fitzroy River (DotE, 2014g), however two individuals were recorded in Brigalow approximately 20 km to the south of the project, outside of the proposed Carmichael Coal Mine site. Habitat for the Ornamental Snake is likely to be found in gilgais in Brigalow, Gidgee, Blackwood (*Acacia argyrodendron*) or Coolibah dominated vegetation communities, or pure grassland associated with gilgais. These vegetation communities are not present in the study area. The Ornamental Snake has been recorded from a range of communities, including the following REs (DotE, 2014g): ➢ 11.4.3 - Open forest dominated by Brigalow and/or Belah clay soils not associated with current alluvium; ➢ 11.4.6 - Gidgee woodland clay soils not associated with current alluvium; ➢ 11.4.8 - Woodland to open forest dominated by Dawson Gum (*Eucalyptus cambageana*) and Brigalow or, sometimes in the north of the species' range, Blackwood/Black Gidgee. Yapunyah (*E. thozetiana*) is sometimes present on shallower clay soils not associated with current alluvium; ➢ 11.4.9 - Open forest, occasionally woodland, dominated by Brigalow on clay soils not associated with current alluvium; ➢ 11.3.3 - Coolibah woodland adjacent to a large, treeless, ephemeral wetland on alluvium (river and creek flats); and ➢ 11.5.16 - Brigalow and/or Belah open-forest in depressions in Cainozoic old loamy and sandy plains. These REs do not occur in the study area. The Ornamental Snake's preferred habitat is within, or close to, habitat that is favoured by its prey - frogs. The species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in flat to gently undulating Tertiary clay plains, but also lake margins and wetlands. Gilgai formations are found where deep-cracking alluvial soils with high clay contents occur (DotE, 2014g). Important populations occur in remnant vegetation on, or surrounding, gilgai mounds and depressions (DotE, 2014g). The Ornamental Snake shelters in logs and under coarse woody debris and ground litter. A number of threats have been identified for the Ornamental Snake, including: habitat loss through clearing, habitat fragmentation, habitat

	degradation by overgrazing by stock, alteration of landscape hydrology in and around gilgai environments, alteration of water quality, contact with the Cane Toad, predation by feral species and invasive weeds (DotE, 2014g).
Potential to Occur in Study Area	The Ornamental Snake has not been recorded from the study area. Two individuals were recorded in Brigalow approximately 20 km to the south of the study area outside of the proposed Carmichael Coal Mine site. These individuals were recorded within Brigalow, which is not present within the study area. Despite the presence of some broadly suitable habitat in the study area (i.e. low lying grassy woodlands supporting frog habitat), no gilgai formations or Brigalow vegetation occurs. It is therefore considered that due to the absence of preferred habitat (i.e. Brigalow and gilgai formations) and lack of records within the study area, this species has a low potential to occur.

Table H.4 Assessment of Likelihood of Occurrence – Migratory and Marine Species

Wetland-dependent Species – Glossy Ibis and Magpie Goose	
Species Overview	The Glossy Ibis is a listed migratory and marine species under the EPBC Act and was listed in the Queensland Wildlife Online database search (**Appendix B**) as being recorded within the locality. This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. This species preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, floodplains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons (DotE, 2014u). The Magpie Goose is a listed marine species under the EPBC Act and was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**). This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. This species inhabits shallow swamps and associated grassland, feeding on tubers and green grass. During the wet season, this species usually nest in extensive colonies. During the dry season, Magpie Geese travel hundreds of kilometres to perennial swamps (Garnett and Crowley, 2000).
Potential to Occur in Study Area	The Glossy Ibis record (**Appendix B**) and the Magpie Goose prediction to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**) are most likely from Lake Buchanan, a permanent lake located approximately 17 km via direct line to the west of the study area. The study area may provide very limited habitat in the form of the two seasonal wetlands (**Figure 10**). Although the seasonal wetlands within

	the study area (**Figure 10**) may contain large remnant pools during the wet season and early dry season, they are not wetlands as such and are unreliable water sources that are unlikely to provide important habitat for these species as they dry out in the dry season. The Glossy Ibis and Magpie Goose have therefore been assessed as having a low potential of occurring within the study area.
Raptors - White-bellied Sea-Eagle	
Species Overview	The White-bellied Sea-Eagle is a listed migratory and marine species under the EPBC Act and was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**). This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. This species inhabits coastal areas, especially those close to the sea shore, and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands (DotE, 2014m). The White-bellied Sea-Eagle is found in habitats that are characterised by the presence of large areas of open water (larger rivers, swamps, lake and the sea).
Potential to Occur in Study Area	Habitat components necessary for this species are absent within the study area due to an absence of: large areas of open water, coast line and terrestrial wetlands in tropical and temperate regions. Due to the lack of potential habitat for this species (i.e. large areas of open water) and lack of records for this species, it is considered that this species would have a low potential to occur within the study area.
Coastal Species - Common Sandpiper, Sharp-tailed Sandpiper Common Greenshank, Marsh Sandpiper and Caspian Tern	
Species Overview	The Common Sandpiper, Sharp-tailed Sandpiper, Common Greenshank and Marsh Sandpiper are all listed as migratory and marine species under the EPBC Act, while the Caspian Tern is listed as a migratory species under the EPBC Act. All five species were listed in the Queensland Wildlife Online database search (**Appendix B**) as being recorded within the locality. All five species are generally restricted to coastal habitats and have limited distributions within the mainland. The Common Sandpiper inhabits coastal wetlands and some saline inland wetlands (DotE, 2014a). The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation (DotE, 2014f). The Caspian Tern is widespread in coastal regions and is mostly found in sheltered coastal areas, such as harbours, lagoons, inlets, bays, estuaries and river deltas (DotE, 2014n). The Caspian Tern is also occasionally found inland around lakes, waterholes, reservoirs, rivers and creeks (DotE, 2014n). The Common Greenshank inhabits coastal habitats and can be found in terrestrial wetlands comprising swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats (DotE, 2014x). The Marsh Sandpiper

	is mostly found along the coastline, but can occur in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks (DotE, 2014y).
Potential to Occur in Study Area	These records (**Appendix B**) are most likely from Lake Buchanan, a permanent lake located approximately 17 km via direct line to the west of the study area. The study area may provide very limited habitat in the form of the two seasonal wetlands (**Figure 10**). Although the seasonal wetlands within the study area (**Figure 10**) may contain large remnant pools during the wet season and early dry season, they are not wetlands as such and are unreliable water sources that are unlikely to provide important habitat for these species as they dry out in summer. These species have therefore been assessed as having a low potential of occurring within the study area.

Table H.5 Assessment of Likelihood of Occurrence – Red Goshawk

Species Overview	The Red Goshawk is listed as Vulnerable under the EPBC Act and Endangered under the NC Act. It is ranked as high under the EHP Back on Track species prioritisation framework (DERM, 2010a). This species was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**). The Red Goshawk is a large, swift and powerful rufous-brown hawk. It occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia, including riverine forests (DotE, 2014j). Vegetation types utilised include Eucalyptus woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins. These habitats typically support high bird numbers and biodiversity, especially medium to large species which the goshawk requires for prey. The Red Goshawk nests in large trees, frequently the tallest and most massive in a tall stand, and nest trees are invariably within one km of permanent water (DotE, 2014j). The study area lies at the western edge of this species' distribution, and it is more commonly found in areas closer to the coast. It is considered that north-east Queensland (north of 20°S) and eastern Cape York Peninsula are the strongholds for the species in eastern Australia (DERM, 2012). This is further north than the study area which lies south of 21.5°S. Published information on population sizes and numbers of known birds have provided estimates for the South East Queensland, Wet Tropics, Cape York Peninsular and the North West Highlands bioregions, but no estimates are available for the Desert Uplands Bioregion, where the study area is situated (**Figure 3**). Threats to the Red Goshawk include (DotE, 2014j):

	➢ Habitat loss; ➢ Fragmentation; ➢ Threats to nest sites; ➢ Threats to prey base; ➢ Threats to prey availability; and ➢ Information gaps. A National Recovery Plan has been prepared for this species with the aim of maintaining populations of the Red Goshawk across its range and implementing measures to promote recovery of the species (DERM, 2012). Important populations have not been defined for the Red Goshawk due to the difficulties in defining what constitutes a 'population' of this widely dispersed species, and due to the very large home range size (DERM, 2012).
Potential to Occur in Study Area	The Red Goshawk was not recorded during recent surveys of the study area, or surveys associated with the CCM&RP. Favored habitats (i.e. coastal and sub-coastal areas, forested lands of tropical and warm-temperate Australia, and riverine forests) are not present within the study area and this species was not recorded during extensive recent surveys of the study area. It is therefore considered that this species has a low potential within the study area.

Table H.6 Assessment of Likelihood of Occurrence – Star Finch (eastern subspecies)

Species Overview	The Star Finch (eastern subspecies) is listed as Endangered under the EPBC Act and NC Act and was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**). The Star Finch (eastern subspecies) has a highly restricted distribution and is only known to occur in four subpopulations, none of which occur in or near the study area. The Star Finch (eastern subspecies) occurs mainly in grasslands and grassy woodlands that are located close to bodies of fresh water as well as cleared or suburban areas such as along roadsides and in towns (DotE, 2014s). The main threat to this species is the degradation of habitat, over-grazing and trampling of habitat by livestock (DotE, 2014s). Other threats include the invasion of habitat by weeds, the contamination of habitat by mining operations, and illegal collection for the bird trade (DotE, 2014s).
Potential to Occur in Study Area	This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. The Star Finch (eastern subspecies) has a highly restricted distribution and is only known to occur in four subpopulations, none of which occur in or near the study

	area. Although there is some suitable habitat present for the Star Finch (eastern) in the form of ephemeral drainage lines, there was no evidence of this species during surveys, despite several other finch species being recorded in areas of suitable habitat, and accordingly, it is considered that this species has a low potential to occur.

Table H.7 Assessment of Likelihood of Occurrence – Greater Bilby

Species Overview	The Greater Bilby is listed as Vulnerable under the EPBC Act and Endangered under the NC Act and was predicted to occur in the study area in the EPBC Act Protected Matters Search (**Appendix A**). It is ranked as critical under the EHP Back on Track species prioritisation framework (DERM, 2010a). The Greater Bilby is a delicately-built rabbit-sized marsupial with long, soft, blue-grey fur over most of the body and white to cream on the belly. It has large ears, a long pointed snout and a black tail with a white tip. This species grows to 55 cm long with a tail up to 29 cm long (DotE, 2014p). Extant population of the Greater Bilby occur in a variety of habitats, usually on landforms with level to low slope topography and light to medium soils. It occupies three major vegetation types: open tussock grassland on uplands and hills, Mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas (DotE, 2014p). These habitat types are absent within the study area which is characterised by Eucalyptus and Acacia open woodlands. Laterite and rock feature substrates are an important part of Greater Bilby habitat. These habitats support Acacia shrub species which have root-dwelling larvae that provide a constant food source for the Greater Bilby. They also contain Spinifex hummocks which are quite uniform and discrete, providing runways between hummocks, enabling easier movement and foraging. The distribution of Greater Bilbies can be limited by the availability of suitable burrowing habitat, such as dunes where burrow excavation is easier (DotE, 2014p). Wild Bilby populations are now restricted predominantly to the Tanami Desert, Northern Territory, the Great Sandy and Gibson Deserts, Western Australia, and an outlying population in south-west Queensland (DotE, 2014p). In Queensland, the species is restricted to the Channel Country and Mitchell Grass Downs Bioregions (Diamantina Shire) (**Figure 3**) in an area bordered by the settlements of Birdsville, Bedourie, Boulia and Betoota (Pavey, 2006). The study area is located outside of these areas. A National Recovery Plan (Pavey, 2006) has been prepared for the Greater Bilby which identifies the following threats to the species:

	➢ Predation; ➢ Competition from introduced herbivores; ➢ Habitat degradation from introduced herbivores; ➢ Habitat degradation from inappropriate fire regimes; ➢ Drought; ➢ Habitat destruction and degradation from mining and other development; and ➢ Road mortality.
Potential to Occur in Study Area	This species was not recorded during recent surveys of the study area or surveys associated with the CCM&RP. Due to the lack of potential habitat for this species (i.e. open tussock grassland on uplands and hills, Mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas) and lack of records for this species, it is considered unlikely that this species would have a low potential to occur within the study area.

Table H.8 Assessment of Likelihood of Occurrence – Lawrencia buchananensis

Species Overview	*Lawrencia buchananensis* is listed as Vulnerable under the EPBC Act. This species was not predicted to occur within the study area in the EPBC Act Protected Matters Search (**Appendix A**), but was listed in the Queensland Wildlife Online database search (**Appendix B**) as occurring in the locality. This species is a shrub that grows to 1 m in height. Leaves are sessile (lack stalks) and are arranged alternately on the stems or are clustered on reduced branches (Threatened Species Scientific Committee, 2008a). Leaf blades are 10–30 mm long, 2–60 mm wide, and flat. It has white flowers approximately 6-8 mm long and small fruit approximately 1.5–3.5 mm long and 2.5–4.2 mm wide, breaking apart into five segments when ripe (Threatened Species Scientific Committee, 2008a). Flowering occurs in June. *Lawrencia buchananensis* is known from a single population that occurs around the fringe of Lake Buchanan (**Figure 3**) and nearby Lake Constant, approximately 17 km via direct line to the west of the study area. While it is relatively common in this location, it is restricted to relatively saline habitats such as salt meadows surrounding the lake, on saline clays, sandy muds, and sand dunes (Threatened Species Scientific Committee, 2008a). Associated vegetation includes low shrubland, herbland and sedgeland with *Epaltes australis*, *Halosarcia* sp. and *Fimbrystylis* spp. The main identified threat to *Lawrencia buchananensis* is grazing by cattle and feral pigs. Both the above-ground and below-ground parts of plants are heavily browsed by cattle and pigs, respectively (Threatened

	Species Scientific Committee, 2008a). Existing plans or management prescriptions that are relevant to the species are the *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission: Feral Pigs* (DEH, 2005) and the *Management Program for Protected Plants in Queensland 2011 – 2015* (DERM, 2010b).
Potential to Occur in Study Area	*Lawrencia buchananensis* was not recorded during recent surveys of the study area, or surveys associated with the CCM&RP. No saline habitats are present in the study area, and despite the relative proximity of the known population of this species along the fringe of Lake Buchanan and Lake Constant located approximately 17 km via direct line to the west of the study area, no suitable habitat occurs in the study area and the species therefore has a low potential to occur.

Table H.9 Assessment of Likelihood of Occurrence – Waxy Cabbage Palm

Species Overview	The Waxy Cabbage Palm is listed as Vulnerable under the NC Act and the EPBC Act and has been recorded from the proposed Carmichael Coal Mine site. It is ranked as critical under the EHP Back on Track Species Prioritisation Framework (EHP 2014a). This species was not predicted to occur within the study area in the EPBC Act Protected Matters Search (**Appendix A**) but was listed in the Queensland Wildlife Online database search (**Appendix B**) as occurring within the locality. In addition, this species has been recorded along the Carmichael River approximately 27 km south of the study area within the proposed Carmichael Coal Mine site. The Waxy Cabbage Palm is a stout single-trunked fan-leaved palm growing to 20 m in height (DotE, 2014o). Inflorescences are densely woolly, multi-branched and about 1 m in length. This palm is endemic to the Burdekin River catchment, where it is restricted to permanent pools in ephemeral, sandy watercourses (DotE, 2014o). This species habitat comprises open woodland on sandy river and creek channels which flow for part of the year, with permanent pools or soaks (DotE, 2014o). This species has been classified by Rodd (1998) as a short-trunked palm that is found in alluvial flood-channels and soaks in semi-arid environments. Pettit and Dowe (2004) undertook extensive surveys for the Waxy Cabbage Palm within the Burdekin River Catchment in 2002 and 2003. The majority of sites where the Waxy Cabbage Palm was found comprised seasonally flowing braided streams on sandy soils, second order streams on basalt soils, rivers and floodplains (Pettit and Dowe, 2004). Results indicated that the Waxy Cabbage Palm occurs mostly along first and second order streams and appears to be restricted to the riparian zone (Pettit and Dowe, 2004). Where individuals were seen growing away from streams on the adjoining country, the areas were assessed as having a high watertable (Pettit and Dowe, 2004). Despite being an apparently vigorous and hardy species, the Waxy

	Cabbage Palm has a very restricted distribution, which may be due to the fact that during periodic severe drought conditions, only stands growing on permanent soaks in stream beds survive (DotE, 2014o). Due to its restricted distribution, Waxy Cabbage Palm is at risk from localised threats (e.g. fire, trampling by stock and clearing for development) and the potential introduction of weeds (Threatened Species Scientific Committee, 2008b). Recruitment is severely restricted by the impact of cattle grazing (DotE, 2014o).
Potential to Occur in Study Area	The Waxy Cabbage Palm was not recorded during recent surveys of the study area. As noted above, the nearest record for this species is from the Carmichael River, in an area where the river is permanently flowing and fed by groundwater. This habitat is not present in the study area. There are no permanently flowing waterways in the study area, and the drainage lines that traverse the study area are highly ephemeral. The only permanent water in the study area is associated with two artificial farm dams and small remnant pools in ephemeral drainage lines. These remnant pools contain surface water from previous rainfall events, and would therefore dry out during extended drought conditions. There are no pools or soaks fed by groundwater within the study area. The study area therefore does not contain optimum habitat for this species, nor is this species predicted to occur in the EPBC Act Protected Matters Search (**Appendix B**). The ephemeral drainage lines within the study area, and particularly any remnant pools, were extensively searched during the recent surveys. The Waxy Cabbage Palm is a large, conspicuous plant, and it is unlikely that this species occurs and was not recorded. Accordingly, this species is considered to have a low potential to occur.

Appendix I

Description of Recorded REs

Table I.1 Description of REs Recorded within the Study Area

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
10.3.6 *Eucalyptus brownii* open-woodland on alluvial plains	Least Concern	Remnant	*Eucalyptus brownii* dominates the very sparse canopy. Occurs on alluvial plains with clays and texture contrast soils.	Located in the southern portion of the study area within one mixed patch.
10.3.6a *Eucalyptus brownii* open-woodland on alluvial plains	Least Concern	Remnant	*Eucalyptus brownii* dominates the very sparse to sparse canopy. *Corymbia dallachiana* and *E. melanophloia* frequently occur in the canopy and sometimes as co-dominants. Occurs on alluvial plains with clays and texture contrast soils.	Found scattered throughout the southern portion of the study area.
10.3.10 *Corymbia dallachiana* and *C. terminalis* open-woodland on old alluvial plains (western)	Least Concern	Remnant	*Corymbia dallachiana* and *C. terminalis* dominate the very sparse canopy and sometimes with *C. plena* with a variable lower tree storey on sandy yellow earths on old alluvial sandplains. These *Corymbia spp*. and *Grevillea parallela* occasionally form a very sparse low tree layer or occur as scattered small trees. *Carissa lanceolata* and *Eremophila mitchellii* frequently dominate the shrub layer and *Acacia sericophylla*, *A. melleodora*, *Senna artemisioides* and *Petalostigma pubescens* are frequently present. The very sparse to sparse ground layer is frequently dominated by *Triodia pungens*.	Located in the southern portion of the study area within one mixed patch.
10.3.11a *Corymbia leichhardtii* woodland on alluvium in valleys	Least Concern	Remnant	*Corymbia leichhardtii* dominates the very sparse canopy. *E. exilipes* and *Acacia shirleyi* occasionally occur as co-dominants in the canopy. Occurs on deep sandy colluvial and alluvial soils in valleys incised in sandstone ranges and plateaus.	Scattered occurrences within mixed patches in the northern portion of the study area.

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
10.3.14 *Eucalyptus camaldulensis* and/or *E. coolibah* open woodland along channels and on floodplains	Least Concern	Remnant	*Eucalyptus camaldulensis* and/or *E. coolabah* dominate the very sparse to sparse canopy on channels, levees and floodplains. *Acacia harpophylla* or *A. cambagei*, may be present as clumps or scattered trees. Occurs on channels, levees and flood plains with sandy to clayey soils along larger watercourses.	Two small patches in the southern portion of the study area along ephemeral drainage lines.
10.3.14c Sandy river beds	Least Concern	Remnant	Riverine wetland or fringing riverine wetland. Mostly bare sand on beds of larger streams with scattered trees and shrubs. Sandy river beds.	One small mixed patch occurs along an ephemeral drainage line in the southern portion of the study area.
10.3.14d *Eucalyptus camaldulensis* with or without *Corymbia leichhardtii* open-woodland along watercourses	Least Concern	Remnant	Riverine wetland or fringing riverine wetland. *Eucalyptus camaldulensis* dominates the vary sparse canopy. *Corymbia leichhardtii* is frequently present as a co-dominant. *E. exilipes, C. citriodora* and *Lophostemon suaveolens* sometimes occur as subdominants in the canopy. *Acacia* spp. usually define the very sparse to sparse shrub layer. *Themeda avenacea* frequently dominates the ground layer. Occurs along stream channels mostly in upper parts of catchments of eastern flowing streams.	One patch in the northern portion of the study area along ephemeral drainage lines.
10.3.15k *Eucalyptus brownii* open-woodland in closed depressions	Least Concern	Remnant	*Eucalyptus brownii* dominates the very sparse canopy. *E. brownii* also occurs as scattered trees or forms a low tree layer. Ground layer dominated by *Eulalia aurea*. Includes ephemeral grasslands, herblands, clay pans and some partially open depressions. Occurs on grey clay soils in closed depressions on Tertiary sand plain or ferricrete.	One patch in the northern portion of the study area.
10.3.16d	Least Concern	Remnant	*Triodia longiceps* dominates the sparse ground layer, ephemeral	Two small patches along an

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
Ephemeral lakes with sparse-herbland or sparse-tussock grassland			open herblands, *Melaleuca bracteata* low woodland and sparsely vegetated saline clay plains. Palustrine wetland (e.g. vegetated swamp). Mostly water or bare ground. Scattered forbs and grasses including *Sclerolaena* spp. may occur during dry periods. Occurs on infrequently flooded alluvial plains or fringing sandy closed depressions.	ephemeral drainage line in the southern portion of the study area.
10.3.28a *Eucalyptus melanophloia* open-woodland on sandy alluvial fans	Least Concern	Remnant	*Eucalyptus melanophloia* dominates the very sparse to sparse tree layer. *Corymbia dallachiana* is occasionally present in the canopy or subcanopy. A low tree layer or shrub layer are usually absent although there can be scattered small trees and shrubs present. *Aristida benthamii, Sehima nervosum, Digitaria brownii, Chrysopogon fallax, Enneapogon polyphyllus, Schizachyrium fragile* and *Eriachne mucronata* occur as dominants and some co-dominants. Occurs on sandy alluvial fans with yellow earth and duplex soils formed from outwash from sandstone hills.	Occurs within the large southern portion of the study area; from the eastern boundary stretching in a band towards the centre of the study area and some scattered mixed patches are also present in the southern portion of the study area.
10.5.1a *Eucalyptus similis* open-woodland on sand plains	Least Concern	Remnant	*Eucalyptus similis* dominates the very sparse tree layer. There is frequently a dense shrub layer. *Corymbia brachycarpa* is frequently present in the canopy. *E. drepanophylla* can occasionally occurs as a co-dominant. The low tree layer is very sparse or composed of scattered small trees including *Bursaria incana, Acacia sericophylla, Alphitonia excelsa* and *Grevillea glauca*. Occurs on deep red earths on Tertiary sand plains.	Occurs as scattered large and small mixed patches throughout the study area.
10.5.1c *Eucalyptus similis* and *Corymbia*	Least Concern	Remnant	*Eucalyptus similis* and *Corymbia setosa* dominate the very sparse canopy. The shrub layer is usually very sparse with	Occurs in three mixed patches within the southern portion of

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
setosa low open-woodland on sand plains			*Lithomyrtus microphylla, Carissa lanceolata, Gastrolobium grandiflorum* and *Jacksonia ramosissima* often present. *Triodia pungens* usually dominants the very sparse to sparse ground layer.	the study area.
10.5.1d *Corymbia setosa* low open-woodland on sand plains	Least Concern	Remnant	*Corymbia setosa* dominates the very sparse canopy. *Melaleuca nervosa, Acacia sericophylla, A. elachantha, Bursaria incana, Grevillea glauca* and *Petalostigma pubescens* are frequently present in the very sparse low trees layer or occur as scattered small trees. *Acacia* spp. and *Carissa lanceolata* dominate the very sparse shrub layer. The ground layer is usually dominated by *Triodia pungens*.	Scattered mixed patches occur throughout the southern and central portions of the study area.
10.5.4 *Eucalyptus crebra* or *E. drepanophylla* open woodland on sand plains	Least Concern	Remnant	*Eucalyptus crebra* or *E. drepanophylla* usually with *Corymbia dallachiana* and/or *C. brachycarpa* dominate the very sparse tree layer. Occurs on sandy red and yellow earths on undulating sandplains.	Two large mixed patches in the southern portion of the study area.
10.5.4b *Eucalyptus crebra* open-woodland on sand plains	Least Concern	Remnant	*Eucalyptus crebra* dominates the very sparse canopy. *Corymbia dallachiana* is commonly present in the canopy. *Petalostigma pubescens, Bursaria incana* and *Grevillea parallela* are frequently present as small trees. *Denhamia cunninghamii* is present in the very sparse shrub layer. *Chrysopogon fallax, Eriachne mucronata, Heteropogon contortus* and *Themeda triandra* are commonly present and sometimes dominate the very sparse to mid-dense ground layer.	Scattered throughout the study area
10.5.5a	Least Concern	Remnant	*Eucalyptus melanophloia* dominates the very sparse canopy.	Scattered throughout the

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
Eucalyptus melanophloia open-woodland on sand plains			*Corymbia plena* and *C. dallachiana* are occasionally co-dominants in the canopy. *Petalostigma pubescens* and *Acacia* spp. occasionally occur as dominants or as scattered tress in the very sparse to mid-dense low tree layer. Occurs on loamy red and yellow earths on undulating sand plains.	southern portion of the study area over a wide area.
10.5.10 *Corymbia leichhardtii* open woodland on sand plains	Least Concern	Remnant	*Corymbia leichhardtii* often with *C. brachycarpa* or *Eucalyptus drepanophylla* dominate the very sparse tree canopy in the south with sparse hummock grass ground layer of *Triodia* spp. or in the extreme north low open woodland to mostly open woodland of *Eucalyptus exilipes* with or without *C. leichhardtii* and/or *C. brachycarpa* with sparse hummock grass ground layer of *Triodia* spp. *Corymbia leichhardtii* dominates the very sparse canopy. *Corymbia brachycarpa* is frequently occurring and sometimes co-dominant in the canopy. *Eucalyptus drepanophylla* is commonly present in some areas. *Acacia leptostachya, Jacksonia ramosissima* and *Carissa lanceolata* are commonly present and sometimes dominant in the very sparse to sparse shrub layer. *Triodia pungens* is frequently dominant in the very sparse to sparse ground layer. *Eriachne mucronata* and *Aristida* spp. are frequently present and sometimes dominant. Occurs on flat to gently sloping terrain usually on perimeter of sand plain plateaus often with shallow duplex soils.	Occurs in small to medium sized mixed patches around the central portion of the study area and western edge of the southern portion of the study area.
10.7.2a *Eucalyptus persistens* low open-	Least Concern	Remnant	*Eucalyptus persistens* dominates the very sparse canopy. *Melaleuca tamariscina* is occasionally present as scattered	Occurs in the west in the southern portion of the study

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
woodland with soft spinifex on ferricrete above scarps			small trees. *Triodia pungens* often dominates the very sparse to sparse ground layer. Occurs on gently sloping terrain with shallow to skeletal soils usually near margins of lateritised plateaus above scarps.	area and in a small area in the centre of the study area.
10.7.3a *Acacia catenulata* low woodland on scarps	Least Concern	Remnant	*Acacia catenulata* dominates the sparse canopy low tree layer. *A. shirleyi, Eucalyptus persistens* and *Corymbia dallachiana* occur as scattered trees in the canopy. *Everistia vacciniifolia* and *Phebalium glandulosum* occasionally occur in the shrub layer. *Pandorea pandorana* is an occasionally occurring vine. *Aristida caput-medusae, Cleistochloa subjuncea, Eragrostis lacunaria* and *Triodia pungens* are occasionally present to sometimes dominant in the very sparse ground layer. Occurs on the exposed mottled zone on scarps with skeletal soils, and above scarps with red earths usually on ferricrete, at the margins of Tertiary plateaus.	One small mixed patch in the centre of the study area and one small patch in the southern portion of the study area.
10.7.3b *Acacia shirleyi* woodland on scarps	Least Concern	Remnant	*Acacia shirleyi* dominates the sparse tree layer. *Eucalyptus exilipes* is occasionally present and sometimes a co-dominant in the canopy in northern areas. *Erythroxylon australe* occasionally occurs as scattered shrubs in the shrub layer. *Cleistochloa subjuncea* is commonly present and frequently dominates the very sparse to mid-dense ground layer. *Triodia pungens* is occasionally present and sometimes dominant.	Small occurrences located at the centre of the study area, and in the south- western corner of the southern portion of the study area.
10.7.3c *Corymbia lamprophylla* and/or *C.*	Least Concern	Remnant	*Corymbia lamprophylla* and/or *C. leichhardtii* dominate the sparse canopy. *Jacksonia ramosissima, Lithomyrtus*	Largest scattered occurrence to the very north of the study area.

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
leichhardtii open-woodland on ferricrete above scarps			*microphylla, Grevillea decora, Hemigenia cuneifolia, Persoonia falcata* and *Petalostigma banksii* are frequently present in the very sparse to sparse shrub layer. *Triodia spp*. and *Schizachyrium fragile* dominate the very sparse to sparse ground layer.	Smaller occurrences located in the centre of the study area.
10.7.4 *Eucalyptus persistens* low-open woodland on pediments below scarps	Least Concern	Remnant	*Eucalyptus persistens* dominates the mostly very sparse tree layer. *Triodia* spp. dominate the very sparse to sparse ground layer. Occurs on pediments below scarps of lateritised Tertiary plateaus. Texture contrast soils.	Small scattered occurrence in the central portion of the study area and small patches within the large southern portion of the study area along the western boundary.
10.7.5 *Eucalyptus thozetiana* open-woodland on scarps and on pediments below scarps	Least Concern	Remnant	*Eucalyptus thozetiana* dominates the mostly very sparse and sometimes sparse tree layer. *Eremophila mitchellii* is sometimes present as scattered small trees (2.5-6m tall). *Carissa lanceolata* and *Eremophila deserti* are frequently present as scattered shrubs (0.5-2m tall). *Triodia pungens* usually dominates the very sparse to sparse ground layer. *Enchylaena tomentosa* is frequently present. Occurs on scarps with skeletal soils and on pediments below scarps of lateritised plateaus with shallow texture contrast soils.	Very minor occurrence within two small mixed patches along the western border of the southern portion of the study area.
10.7.7b *Melaleuca tamariscina* low open-woodland on ferricrete	Least Concern	Remnant	Shrubland dominated by *Melaleuca tamariscina* as a sparse canopy. *Petalostigma banksii* is often present in the canopy and sometimes co-dominant and rarely dominant. *Triodia spp*. usually dominate the very sparse to sparse ground layer.	Very minor occurrence in two small mixed patches in the southern portion of the study area.

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
			Occurs on ferricrete with skeletal soils and shallow earths often on margins of Tertiary plateaus.	
10.7.11a *Eucalyptus melanophloia* low open-woodland on ferricrete	Least Concern	Remnant	*Eucalyptus melanophloia* dominates the very sparse low tree layer. *Corymbia dallachiana* is often present in the canopy. *Acacia sericophylla* is present in the small tree layer. *Acacia tenuissima* is often present as scattered shrubs or in the very sparse shrub layer. *Triodia pungens* usually dominates the very sparse to mid-dense ground layer. Occurs on gently undulating terrain with shallow yellow earths on ferricrete mostly on margins of plateaus of Tertiary sand plains.	Occurs within a few small mixed patches within the southern portion of the study area.
10.7.12a *Eucalyptus drepanophylla* open-woodland on ferricrete	Least Concern	Remnant	*Eucalyptus drepanophylla* dominates the very sparse tree layer. *Brachychiton populneus* is occasionally present in the canopy. *Triodia pungens* usually dominates the very sparse to mid-dense ground layer. Occurs on undulating terrain with shallow, often gravelly, yellow earths on ferricrete usually on margins of plateaus of Tertiary sand plains.	Patchy distribution throughout the entire study area.
10.10.1a *Acacia shirleyi* woodland on sandstone ranges	Least Concern	Remnant	*Acacia shirleyi* dominates the sparse to very sparse small tree layer. *Acacia burdekensis, Eucalyptus exilipes, Corymbia trachyphloia* and *E. exserta* occasionally occur as subdominants or co-dominants. The shrub layer is highly variable ranging from very sparse to mid-dense. *Cleistochloa subjuncea* frequently dominates the very sparse to sparse ground layer. *Triodia pungens* is occasionally dominant. Occurs on rocky hills or pediments to talus below cliffs with skeletal soils to shallow	Largely scattered at the southern end of the northern portion of the study area, with some mixed patches in the northern portion of the study area.

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
			earths on sandstone ranges (BVG1M: 24a).	
10.10.1b *Acacia catenulata* low woodland on sandstone ranges	Least Concern	Remnant	*Acacia catenulata* with or without *Acacia shirleyi* dominate the sparse tree layer. *Acacia catenulata* dominates the sparse canopy. *Acacia shirleyi* is usually present in the canopy. *Erythroxylon australe, Beyeria viscosa* and *Everistia vacciniifolia* are usually present in the very sparse shrub layer.	Several small mixed patches in the central portion of the study area.
10.10.3 *Eucalyptus drepanophylla* open-woodland on sandstone ranges	Of Concern	Remnant	*E. drepanophylla* dominates the very sparse tree layer and *Corymbia lamprophylla* dominates the small tree layer. *C. leichhardtii* can be present in the canopy. *Petalostigma banksii* often dominates the shrub layer. *Jacksonia ramosissima* and *Dodonaea dodecandra* are usually present. *Eriachne mucronata, Alloteropsis semialata* and *Schizachyrium fragile* dominate very sparse ground layer. Occurs on slopes of rocky hills with skeletal soils to shallow sandy earths, often gravelly, on sandstone ranges.	Large areas in the central and northern portions of the study area.
10.10.4a *Corymbia leichhardtii* open-woodland on sandstone ranges	Least Concern	Remnant	*Corymbia leichhardtii* dominates the very sparse tree layer with a ground cover of *Triodia* spp. *Corymbia lamprophylla* and *Acacia shirleyi* are frequently present and sometimes co-dominant in the canopy. Occurs on slopes of rocky hills with sandy to skeletal soils on sandstone ranges (BVG1M: 12a).	Scattered throughout the entire northern and central portions of the study area in large and small mixed patches.
10.10.4c *Eucalyptus similis* open-woodland on sandstone ranges	Least Concern	Remnant	*Eucalyptus similis* dominates the very sparse tree layer. *Corymbia lamprophylla* is present and sometimes co-dominant in the canopy. There is a very sparse to sparse shrub layer. *Triodia spp.* are usually present and sometimes dominate the	Scattered throughout the entire northern and southern portions of the study area in large and small mixed patches.

Regional Ecosystem[1]	Conservation Status under the VM Act[2]	Remnant Status	Species and Structural Composition	Location in the Study Area (refer Figure 11)
			very sparse to sparse ground layer.	
10.10.5a *Corymbia trachyphloia* usually with *C. lamprophylla* open-woodland on sandstone ranges	Least Concern	Remnant	Mostly bloodwoods dominate the tree layer including *Corymbia trachyphloia* subsp. *trachyphloia* or *C. lamprophylla*. A very sparse to mid-dense shrub layer is present. *Schoenus kennyi*, *Triodia spp.* and *Cleistochloa subjuncea* are frequently present in the very sparse ground layer. Occurs on slopes or in valley floors of rocky hills with sandy to skeletal soils on sandstone ranges.	One mixed patch within the northern narrow portion of the study area (towards the south).

1 *DSITIA (2012) Regional Ecosystems Technical Description of the Desert Uplands.*

2 *Threatened RE status under the VM Act (current at 6 March 2015).*

Appendix J

Recorded Flora Species

Table J.1 Plant Species List and Quadrat Data

Plant Species List and Quadrat Data - Quadrats 1- 10												
Family	**Scientific Name**	**Common Name**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**
Acanthaceae	*Brunoniella australis*	Blue Trumpet		a								
Acanthaceae	*Pseuderanthemum variabile*											
Acanthaceae	*Rostellularia adscendens*	-	a									
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern										
Adiantaceae	*Cheilanthes sieberi*	-										
Amaranthaceae	*Achyranthes aspera*	Chaff Flower										a
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed										
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed										
Anthericaceae	*Tricoryne anceps*	-										
Apiaceae	*Eryngium plantagineum*	Long Eryngium										
Apiaceae	*Platysace valida*											
Apocynaceae	*Alstonia constricta*											
Apocynaceae	*Carissa lanceolata*	Currant Bush										
Apocynaceae	*Carissa ovata*	Currant Bush										
Apocynaceae	*Marsdenia microlepis*	-				a						
Apocynaceae	*Parsonsia eucalyptophylla*	Gargaloo										
Apocynaceae	*Parsonsia lanceolata*											
Asteraceae	*Calotis sp.*	a Burr-daisy							a			
Asteraceae	*Camptacra barbata*	-										
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting	a	a,s					s			c
Asteraceae	*Coronidium glutinosum*							a				
Asteraceae	*Cyanthillium cinereum*											
Asteraceae	*Emilia sonchifolia*	Lilac Tasselflower					a					
Asteraceae	*Epaltes australis**	-					a					

Asteraceae	*Parthenium hysterophorus*											
Asteraceae	*Peripleura bicolor*											
Asteraceae	*Peripleura virgata*	-		a								
Asteraceae	*Pterocaulon redolens*	Rag Weed, Pintye-Pintye					a					a
Asteraceae	*Pterocaulon serrulatum*											
Asteraceae	*Rutidosis leucantha*											
Asteraceae	*Senecio brigalowensis*											
Asteraceae	*Vittadinia pustulata*	a Fuzzweed										a
Asteraceae	*Wedelia spilanthoides*											
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine										
Boraginaceae	*Heliotropium sp.*											
Byttneriaceae	*Keraudrenia collina*	-					a			a		
Byttneriaceae	*Waltheria indica*											
Caesalpiniaceae	*Chamaecrista absus*											
Caesalpiniaceae	*Chamaecrista concinna*	-										s
Caesalpiniaceae	*Chamaecrista mimosoides*											
Caesalpiniaceae	*Chamaecrista nomame*											
Caesalpiniaceae	*Lysiphyllum carronii*											
Caesalpiniaceae	*Senna costata*	-		a								
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell										
Campanulaceae	*Wahlenbergia gracilis*	a Bluebell	a									
Campanulaceae	*Wahlenbergia sp.*											
Capparaceae	*Capparis canescens*	-										
Capparaceae	*Capparis lasiantha*	Nepine										
Caryophyllaceae	*Polycarpaea corymbosa*											
Celastraceae	*Maytenus cunninghamii*	Western Rosewood		c								

Chenopodiaceae	*Einadia nutans*	climbing saltbush										
Clusiaceae	*Hypericum gramineum*	Small St John's Wort										
Combretaceae	*Terminalia oblongata*	Yellow-wood										
Convolvulaceae	*Evolvulus alsinoides*											
Convolvulaceae	*Ipomoea sp.*									a		
Cyperaceae	*Abildgaardia ovata*											
Cyperaceae	*Bulbostylis barbata*	Watergrass										
Cyperaceae	*Cyperus conicus*	-								a		
Cyperaceae	*Cyperus difformis*	Dirty Dora								a		
Cyperaceae	*Cyperus flaccidus*	Lax Flat-sedge										
Cyperaceae	*Cyperus fulvus*	Sticky Sedge								a		
Cyperaceae	*Cyperus gracilis*											
Cyperaceae	*Cyperus holoschoenus*											
Cyperaceae	*Cyperus lucidus*	Leafy Flat Sedge								c		
Cyperaceae	*Eleocharis plana*	Flat Spike-sedge										
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge	a						a			a
Cyperaceae	*Gahnia aspera*	Saw Sedge								a		
Cyperaceae	*Schoenoplectus dissachanthus*	Blunt Club-sedge										
Cyperaceae	*Schoenoplectus lateriflorus*	-										
Cyperaceae	*Schoenus kennyi*	-			s	a						
Cyperaceae	*Scleria mackaviensis*											
Cyperaceae	*Scleria sphacelata*							a				
Cyperaceaee	*Cyperus perangustus*	Umbrella Sedge										
Droseraceae	*Drosera burmanni*	a Sundew							a			
Droseraceae	*Drosera indica*	Flycatcher										
Euphorbiaceae	*Beyeria viscosa*	a Wallaby Bush			a	c		s				
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed										

Euphorbiaceae	*Euphorbia mitchelliana*	a Spurge										a
Fabaceae	*Aeschynomene indica*											
Fabaceae	*Cajanus marmoratus*	-										a
Fabaceae	*Crotalaria medicaginea*											
Fabaceae	*Crotalaria mitchellii subsp. mitchellii*	Yellow Rattlepod										
Fabaceae	*Crotalaria montana*	a Rattlepod										
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil										
Fabaceae	*Desmodium varians*	Slender Tick-trefoil										
Fabaceae	*Erythrina verspetilio*	Native Coral Tree										
Fabaceae	*Galactia tenuiflora*	a Lovecreeper	a	a								s
Fabaceae	*Gastrolobium grandiflorum*	Heart-leaf Poison Bush										
Fabaceae	*Glycine clandestina*	a Lovecreeper										
Fabaceae	*Glycine sp. (Mackay SBAndrews+43)*											
Fabaceae	*Glycine tomentella*	a Lovecreeper					a					
Fabaceae	*Hovea parvicalyx*	-			c						a,s	
Fabaceae	*Indigo linifolia*	Narrow-leaf Indigo										
Fabaceae	*Indigofera colutea*		a	a								
Fabaceae	*Indigofera haplophylla*											
Fabaceae	*Indigofera hirsuta*	Hairy Indigo	a									
Fabaceae	*Indigofera linifolia*	-										a
Fabaceae	*Indigofera linnaei*	Birdsville Indigo										
Fabaceae	*Indigofera pratensis*			c								
Fabaceae	*Indigofera sp. (Aramac E.J.Thompson+ JER177*	-										
Fabaceae	*Jacksonia ramosissima*	a Dogwood		a	s							
Fabaceae	*Jacksonia rhadinoclada*											
Fabaceae	*Labichea rupestris*	-			s	c					a,s	

Fabaceae	*Mirbelia aotoides*											
Fabaceae	*Mirbelia viminalis*											
Fabaceae	*Rhynchosia minima*		a									
Fabaceae	*Stylosanthes scabra**	a Rattlepod										
Fabaceae	*Tephrosia brachyodon*	-							a			
Fabaceae	*Tephrosia juncea*	-										
Fabaceae	*Tephrosia leptoclada*											
Fabaceae	*Uraria lagopodioides*	Prickitch		a								a
Fabaceae	*Vigna lanceolata*	Maloga Bean										
Fabaceae	*Zornia areolata*		a									
Fabaceae	*Zornia dyctiocarpa var. Filifolia*								a			
Gentiaceae	*Schenkia australis*	-							a			
Goodeniaceae	*Goodenia armitiana*											
Goodeniaceae	*Goodenia gracilis*	Slender Goodenia										
Goodeniaceae	*Goodenia grandiflora*	-										
Goodeniaceae	*Goodenia hederacea*											
Goodeniaceae	*Goodenia sp.*	-	a	a								
Goodeniaceae	*Goodenia splendida*	-										
Haloragaceae	*Gonocarpus sp.*											
Juncaceae	*Juncus continuus*	-										
Lamiaceae	*Prostanthera parviflora*	-				s						
Lauraceae	*Cassytha filiformis*											
Lauraceae	*Cassytha glabella*											
Lobeliaceae	*Pratia purpurascens*	Whiteroot								a		
Lomandraceae	*Lomandra leucocephala*	Woolly Mat-rush							a			
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush										
Lomandraceae	*Lomandra multiflora*	Many Flowered Matrush										

Loranthaceae	*Amyema quandang*											
Lythraceae	*Rotala mexicana*	-								a		
Malvaceae	*Hibiscus meraukensis*						a			a		
Malvaceae	*Sida cordifolia**							a				a
Malvaceae	*Sida cunninghamiana*	Ridged Sida									a	a
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne										
Malvaceae	*Sida spinosa**	Arrow-leaf Sida										
Marsileaceae	*Marsilea hirsuta*	Hansen's Nardoo										
Mimosaceae	*Acacia cowleana*	Halls Creek Wattle		c						a,d	c	a
Mimosaceae	*Acacia dietrichiana*				c	a	a					
Mimosaceae	*Acacia elachantha*	-										
Mimosaceae	*Acacia excelsa*	-										
Mimosaceae	*Acacia farnesiana*											
Mimosaceae	*Acacia galioides*	-										
Mimosaceae	*Acacia gnidium*	-						c				
Mimosaceae	*Acacia holosericea*	Soapbush Wattle										
Mimosaceae	*Acacia hyaloneura*	-				a						
Mimosaceae	*Acacia laccata*	-										
Mimosaceae	*Acacia leptostachya*	Townsville Wattle					a		d			
Mimosaceae	*Acacia longispicata*											
Mimosaceae	*Acacia melleodora*											
Mimosaceae	*Acacia multisiliqua*											
Mimosaceae	*Acacia platycarpa*	-	a									
Mimosaceae	*Acacia ramiflora*	-									a	
Mimosaceae	*Acacia sericophylla*	-	c	a,c								
Mimosaceae	*Acacia shirleyi*		c		c,d	a,d		d			c	
Mimosaceae	*Acacia sp.*	-							a			

Mimosaceae	*Acacia stipuligera*	-										
Mimosaceae	*Acacia tenuissima*	Narrow-leaved Wattle										
Mimosaceae	*Acacia tropica*	-										
Mimosaceae	*Archidendropsis basaltica*											
Moraceae	*Ficus rubiginosa forma glabrescens*	a Fig										
Myoporaceae	*Eremophila longifolia*											
Myoporaceae	*Eremophila sp.*	an Emubush										
Myoporaceae	*Myoporum acuminatum*	Waterbush										s
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush										
Myrtaceae	*Calytrix microcoma*	Turkey Bush										
Myrtaceae	*Corymbia brachycarpa*	a Bloodwood										
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum										
Myrtaceae	*Corymbia leichhardtii*	Yellowjacket				s	a,c,s	s		a	c	
Myrtaceae	*Corymbia plena*	a Bloodwood		c					c			a,d
Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood							c			
Myrtaceae	*Eucalyptus brownii*	Reid River Box										
Myrtaceae	*Eucalyptus camaldulensis*											
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark										
Myrtaceae	*Eucalyptus drepanophylla*	Narrow Leaved Ironbark	c			a		s				
Myrtaceae	*Eucalyptus exilipes*	Fine-leaved Ironbark										
Myrtaceae	*Eucalyptus fibrosa*	Broad-leaved Ironbark				s	c					
Myrtaceae	*Eucalyptus lamprophylla*	Shiny-leaved Bloodwood				s						
Myrtaceae	*Eucalyptus mediocris*											
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark	c									
Myrtaceae	*Eucalyptus persistens*	-										

Myrtaceae	*Eucalyptus similis*	Inland Yellow Jacket		c								
Myrtaceae	*Eucalyptus spp. mixed specimen*	a mallee eucalypt										
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum								d		
Myrtaceae	*Homoranthus thomasii*											
Myrtaceae	*Lithomyrtus microphylla*					a						
Myrtaceae	*Melaleuca bracteata*	Black Tea-tree										
Myrtaceae	*Melaleuca chisholmii*	A paper bark										
Myrtaceae	*Melaleuca minutifolia*	-										
Myrtaceae	*Melaleuca nervosa*	a Paperbark							c,s			
Myrtaceae	*Melaleuca pallescens*	a Paperbark								a	a	
Myrtaceae	*Melaleuca sp.*	a Paperbark							s			
Myrtaceae	*Melaleuca tamariscina*	a Paperbark										
Myrtaceae	*Thryptomene parviflora*											
Nyctaginaceae	*Boerhavia sp.*											
Oleaceae	*Jasminum didymum*											
Oleaceae	*Jasminum lineare*	-					a					
Onagraceae	*Ludwigia octovalvis*	Native Willow Primrose										
Pentapetaceae	*Melhania ovata*											
Phormiaceae	*Dianella longifolia*	Blueberry Lily		a			a		a			a
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush								a		
Phyllanthaceae	*Phyllanthus collinus*											a
Phyllanthaceae	*Phyllanthus fuernrohrii*											
Phyllanthaceae	*Phyllanthus maderaspatensis*											
Phyllanthaceae	*Phyllanthus sp.*	-	a									
Phyllanthaceae	*Phyllanthus virgatus*	-		a								
Phyllanthaceae	*Sauropus elachophyllus*				a,c	a					a	
Picrodendraceae	*Petalostigma banksii*	Smooth-leaved Quinine										

Picrodendraceae	*Petalostigma pubescens*	Quinine Bush	a	c					a			d,s
Pittosporaceae	*Bursaria incana*	Mock Orange, Prickly Pine	c,d	c								
Poaceae	*Allopteropsis semialata*	Cockatoo Grass	a				a		a			
Poaceae	*Ancistrachne uncinulata*	Hooky Grass										
Poaceae	*Aristida caput-medusae*											
Poaceae	*Aristida holathera*											
Poaceae	*Aristida ingrata*	a Threeawn Grass		a					a			c
Poaceae	*Aristida pruinosa*	a Threeawn Grass	a	s		s	s					a
Poaceae	*Aristida sp.*										c	
Poaceae	*Arundinella nepalensis*	-										
Poaceae	*Bothriochloa bladhii var. bladhii*	Forest Bluegrass										
Poaceae	*Bothriochloa decipiens var. cloncurrensis*	Pitted Bluegrass								a		
Poaceae	*Bothriochloa ewartiana*	Desert Bluegrass								a		
Poaceae	*Bothriochloa sp.*											
Poaceae	*Capillipedium parviflorum*	Scented-top Grass										
Poaceae	*Cenchrus ciliaris**	Buffel Grass	a									
Poaceae	*Cleistochloa subjuncea*	-			a	d		d			c	
Poaceae	*Cymbopogon bombycinus*	a Lemongrass	a	a				a				
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass										
Poaceae	*Cynodon dactylon**	Couch Grass										
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass										
Poaceae	*Digitaria ammophila*	Silky Umbrella-grass	a									
Poaceae	*Digitaria breviglumis*					a					a	
Poaceae	*Digitaria ciliaris**	a Cockatoo Grass										a
Poaceae	*Digitaria diminuta*	-										

Poaceae	*Digitaria gibbosa*								a			c
Poaceae	*Echinochloa colona*	Awnless Barnyard Grass								a		
Poaceae	*Enneapogon lindleyanus*											
Poaceae	*Enneapogon polyphyllus*	-										
Poaceae	*Enneapogon robustissimus*	a Hedgehog Grass										a
Poaceae	*Enneapogon sp.*											
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass										
Poaceae	*Eragrostis brownii*	Brown's Lovegrass										
Poaceae	*Eragrostis elongata*	Clustered Lovegrass								c		
Poaceae	*Eragrostis leptocarpa*											
Poaceae	*Eragrostis sororia*	a Lovegrass	a				s					
Poaceae	*Eragrostis sp.*											
Poaceae	*Eragrostis spartinoides*	a Lovegrass								c	c	
Poaceae	*Eragrostis speciosa*											
Poaceae	*Eriachne obtusa*	Northern Wandarrie Grass							a			
Poaceae	*Eulalia aurea*	-										
Poaceae	*Eulalia fulva*	Silky Browntop										
Poaceae	*Heteropogon contortus*	Black Speargrass	c	c			d		s			s
Poaceae	*Imperata cylindrica*	Bladey Grass										
Poaceae	*Leptochloa decipiens*											
Poaceae	*Leptochloa fusca subsp. fusca*	Brown Beetle Grass										
Poaceae	*Melinis repens**	Red Natal Grass										
Poaceae	*Panicum effusum*	Hairy Panic					s					c
Poaceae	*Panicum larcomianum*	-					a					
Poaceae	*Panicum simile*											

Poaceae	*Panicum sp.*											
Poaceae	*Paspalidium caespitosum*	Brigalow Grass								c		
Poaceae	*Paspalidium distans*	-										
Poaceae	*Paspalum scrobiculatum*											
Poaceae	*Perotis rara*	Comet Grass										a
Poaceae	*Sarga timorense*	-	c	a					a			c
Poaceae	*Schizachyrium fragile*	Fire Grass		a					a			a
Poaceae	*Sehima nervosum*	Rat's-tail Grass										
Poaceae	*Setaria surgens*	-					a					
Poaceae	*Sporobolus caroli*	Yakka Grass										
Poaceae	*Themeda avenacea*	Oat Kangaroo Grass					a					
Poaceae	*Themeda triandra*	Kangaroo Grass		c			s			s		
Poaceae	*Triodia longiceps*	Giant Grey Spinifex		s					d		a	
Poaceae	*Triodia molesta*											
Poaceae	*Triodia pungens*	-										
Poaceae	*Urochloa piligera*	Hairy Armgrass	a									
Polygalaceae	*Comesperma sp.*	-										
Polygonaceae	*Comesperma pallidum*	-							a			
Polygonaceae	*Persicaria sp. (insufficient material)*	a Knotweed										
Proteaceae	*Grevillea decora*				a,c			s				
Proteaceae	*Grevillea glauca*	Bushman's Clothes Pegs		a					a,c			d,s
Proteaceae	*Grevillea parallela*											
Proteaceae	*Grevillea pteridifolia*	Darwin Silky Oak							a			
Proteaceae	*Grevillea sessilis*	Silky Oak					d			d		
Proteaceae	*Hakea lorea*	Bootlace Oak	c	a								
Proteaceae	*Persoonia falcata*											

Proteaceae	*Persoonia sp.*	a Geebung										
Rhamnaceae	*Alphitonia excelsa*	Red Ash				a	s			a		
Rhamnaceae	*Ventilago viminalis*	Supple Jack										
Rubiaceae	*Everistia vacciniifolia var. vacciniifolia*	-										
Rubiaceae	*Pogonolobus reticulatus*											
Rubiaceae	*Psydrax attenuata*											
Rubiaceae	*Spermacoce brachystema*		a									
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood										
Rutaceae	*Geijera salicifolia*	Scrub Wilga										
Rutaceae	*Phebalium glandulosum*	Desert Phebalium										
Santalaceae	*Santalum lanceolatum*	Northern Sandlewood			a	a						
Sapindaceae	*Atalaya hemiglauca*	Whitewood										
Sapindaceae	*Atalaya sp.*	-										
Sapindaceae	*Distichostemon dodecandra*	a Hopbush										
Sapindaceae	*Dodonaea filifolia*	a Hopbush				s					a	
Sapindaceae	*Dodonaea lanceolata*	a Hopbush								a		
Scrophulariaceae	*Eremophila mitchellii*	False Sandalwood										
Scrophulariaceae	*Scoparia dulcis*	Goatweed					a			a		
Solanaceae	*Solanum ferocissimum*	Spiny Potato Bush				a					a	
Solanaceae	*Solanum parviflorum*	-										
Solanaceae	*Solanum sp.*	-						a				
Sparrmanniaceae	*Grewia retusifolia*	Dog's Balls	a				a			a		a
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia										
Stylidiaceae	*Stylidium eriorhizum*	-										
Violaceae	*Hybanthus enneaspermus*	Blue Spade Flower							a			
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	a Grass Tree							s			

Plant Species List and Quadrat Data - Quadrats 11 to 20												
Family	**Scientific Name**	**Common Name**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
Acanthaceae	*Brunoniella australis*	Blue Trumpet		a						a	a	a
Acanthaceae	*Pseuderanthemum variabile*											
Acanthaceae	*Rostellularia adscendens*	-										
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern										
Adiantaceae	*Cheilanthes sieberi*	-										
Amaranthaceae	*Achyranthes aspera*	Chaff Flower										
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed										
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed								a	a	
Anthericaceae	*Tricoryne anceps*	-										a
Apiaceae	*Eryngium plantagineum*	Long Eryngium										
Apiaceae	*Platysace valida*											
Apocynaceae	*Alstonia constricta*											
Apocynaceae	*Carissa lanceolata*	Currant Bush									c	a
Apocynaceae	*Carissa ovata*	Currant Bush										
Apocynaceae	*Marsdenia microlepis*	-										
Apocynaceae	*Parsonsia eucalyptophylla*	Gargaloo										
Apocynaceae	*Parsonsia lanceolata*											
Asteraceae	*Calotis sp.*	a Burr-daisy										
Asteraceae	*Camptacra barbata*	-		a								
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting										
Asteraceae	*Coronidium glutinosum*											
Asteraceae	*Cyanthillium cinereum*											
Asteraceae	*Emilia sonchifolia*	Lilac Tasselflower										
Asteraceae	*Epaltes australis**	-								a	a	a
Asteraceae	*Parthenium hysterophorus*											

Asteraceae	*Peripleura bicolor*											
Asteraceae	*Peripleura virgata*	-										
Asteraceae	*Pterocaulon redolens*	Rag Weed, Pintye-Pintye		a						a		
Asteraceae	*Pterocaulon serrulatum*											
Asteraceae	*Rutidosis leucantha*											
Asteraceae	*Senecio brigalowensis*											
Asteraceae	*Vittadinia pustulata*	a Fuzzweed										
Asteraceae	*Wedelia spilanthoides*										a	a
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine										
Boraginaceae	*Heliotropium sp.*											
Byttneriaceae	*Keraudrenia collina*	-										
Byttneriaceae	*Waltheria indica*										a	
Caesalpiniaceae	*Chamaecrista absus*										a	a
Caesalpiniaceae	*Chamaecrista concinna*	-										
Caesalpiniaceae	*Chamaecrista mimosoides*											
Caesalpiniaceae	*Chamaecrista nomame*											
Caesalpiniaceae	*Lysiphyllum carronii*											
Caesalpiniaceae	*Senna costata*	-										
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell										
Campanulaceae	*Wahlenbergia gracilis*	a Bluebell								a		
Campanulaceae	*Wahlenbergia sp.*											
Capparaceae	*Capparis canescens*	-				a						
Capparaceae	*Capparis lasiantha*	Nepine										
Caryophyllaceae	*Polycarpaea corymbosa*					a						
Celastraceae	*Maytenus cunninghamii*	Western Rosewood									a	
Chenopodiaceae	*Einadia nutans*	climbing saltbush										

Clusiaceae	*Hypericum gramineum*	Small St John's Wort										
Combretaceae	*Terminalia oblongata*	Yellow-wood										
Convolvulaceae	*Evolvulus alsinoides*										a	
Convolvulaceae	*Ipomoea sp.*										a	
Cyperaceae	*Abildgaardia ovata*											
Cyperaceae	*Bulbostylis barbata*	Watergrass				a						
Cyperaceae	*Cyperus conicus*	-								a		
Cyperaceae	*Cyperus difformis*	Dirty Dora								a	a	
Cyperaceae	*Cyperus flaccidus*	Lax Flat-sedge										
Cyperaceae	*Cyperus fulvus*	Sticky Sedge										
Cyperaceae	*Cyperus gracilis*											
Cyperaceae	*Cyperus holoschoenus*											
Cyperaceae	*Cyperus lucidus*	Leafy Flat Sedge										
Cyperaceae	*Eleocharis plana*	Flat Spike-sedge										
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge									a	
Cyperaceae	*Gahnia aspera*	Saw Sedge										
Cyperaceae	*Schoenoplectus dissachanthus*	Blunt Club-sedge										
Cyperaceae	*Schoenoplectus lateriflorus*	-										
Cyperaceae	*Schoenus kennyi*	-	s				a					
Cyperaceae	*Scleria mackaviensis*											
Cyperaceae	*Scleria sphacelata*						c	a	s			
Cyperaceaee	*Cyperus perangustus*	Umbrella Sedge										
Droseraceae	*Drosera burmanni*	a Sundew										
Droseraceae	*Drosera indica*	Flycatcher										
Euphorbiaceae	*Beyeria viscosa*	a Wallaby Bush					a					
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed										
Euphorbiaceae	*Euphorbia mitchelliana*	a Spurge										

Fabaceae	*Aeschynomene indica*											
Fabaceae	*Cajanus marmoratus*	-		a								
Fabaceae	*Crotalaria medicaginea*					a						
Fabaceae	*Crotalaria mitchellii subsp. mitchellii*	Yellow Rattlepod				a						
Fabaceae	*Crotalaria montana*	a Rattlepod			a					a	a	a
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil										
Fabaceae	*Desmodium varians*	Slender Tick-trefoil										
Fabaceae	*Erythrina verspetilio*	Native Coral Tree									a	
Fabaceae	*Galactia tenuiflora*	a Lovecreeper		a		a					a	a
Fabaceae	*Gastrolobium grandiflorum*	Heart-leaf Poison Bush										
Fabaceae	*Glycine clandestina*	a Lovecreeper									a	
Fabaceae	*Glycine sp. (Mackay SBAndrews+43)*											
Fabaceae	*Glycine tomentella*	a Lovecreeper										
Fabaceae	*Hovea parvicalyx*	-							c			
Fabaceae	*Indigo linifolia*	Narrow-leaf Indigo										
Fabaceae	*Indigofera colutea*									a		
Fabaceae	*Indigofera haplophylla*											
Fabaceae	*Indigofera hirsuta*	Hairy Indigo			a							
Fabaceae	*Indigofera linifolia*	-		a						a	a	a
Fabaceae	*Indigofera linnaei*	Birdsville Indigo										a
Fabaceae	*Indigofera pratensis*											a
Fabaceae	*Indigofera sp. (Aramac E.J.Thompson+ JER177*	-										
Fabaceae	*Jacksonia ramosissima*	a Dogwood	a									
Fabaceae	*Jacksonia rhadinoclada*											
Fabaceae	*Labichea rupestris*	-						a				
Fabaceae	*Mirbelia aotoides*											

Fabaceae	*Mirbelia viminalis*											
Fabaceae	*Rhynchosia minima*										a	a
Fabaceae	*Stylosanthes scabra**	a Rattlepod									a	
Fabaceae	*Tephrosia brachyodon*	-										
Fabaceae	*Tephrosia juncea*	-		a	a							
Fabaceae	*Tephrosia leptoclada*										a	
Fabaceae	*Uraria lagopodioides*	Prickitch										
Fabaceae	*Vigna lanceolata*	Maloga Bean								a		
Fabaceae	*Zornia areolata*									a		
Fabaceae	*Zornia dyctiocarpa var. Filifolia*											
Gentiaceae	*Schenkia australis*	-										
Goodeniaceae	*Goodenia armitiana*											
Goodeniaceae	*Goodenia gracilis*	Slender Goodenia										
Goodeniaceae	*Goodenia grandiflora*	-										
Goodeniaceae	*Goodenia hederacea*											
Goodeniaceae	*Goodenia sp.*	-			a							
Goodeniaceae	*Goodenia splendida*	-										
Haloragaceae	*Gonocarpus sp.*											
Juncaceae	*Juncus continuus*	-										
Lamiaceae	*Prostanthera parviflora*	-										
Lauraceae	*Cassytha filiformis*											
Lauraceae	*Cassytha glabella*											
Lobeliaceae	*Pratia purpurascens*	Whiteroot										
Lomandraceae	*Lomandra leucocephala*	Woolly Mat-rush										
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush										
Lomandraceae	*Lomandra multiflora*	Many Flowered Matrush										
Loranthaceae	*Amyema quandang*											

Lythraceae	*Rotala mexicana*	-										
Malvaceae	*Hibiscus meraukensis*											
Malvaceae	*Sida cordifolia**				a							
Malvaceae	*Sida cunninghamiana*	Ridged Sida										
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne										
Malvaceae	*Sida spinosa**	Arrow-leaf Sida								a	a	
Marsileaceae	*Marsilea hirsuta*	Hansen's Nardoo										
Mimosaceae	*Acacia cowleana*	Halls Creek Wattle		a	c					c		a,c
Mimosaceae	*Acacia dietrichiana*											
Mimosaceae	*Acacia elachantha*	-						a				
Mimosaceae	*Acacia excelsa*	-										
Mimosaceae	*Acacia farnesiana*											
Mimosaceae	*Acacia galioides*	-		a	a							
Mimosaceae	*Acacia gnidium*	-										
Mimosaceae	*Acacia holosericea*	Soapbush Wattle										
Mimosaceae	*Acacia hyaloneura*	-										
Mimosaceae	*Acacia laccata*	-										c
Mimosaceae	*Acacia leptostachya*	Townsville Wattle										
Mimosaceae	*Acacia longispicata*											
Mimosaceae	*Acacia melleodora*					s						
Mimosaceae	*Acacia multisiliqua*											
Mimosaceae	*Acacia platycarpa*	-										
Mimosaceae	*Acacia ramiflora*	-										
Mimosaceae	*Acacia sericophylla*	-		a					a			a
Mimosaceae	*Acacia shirleyi*		d				a,d,s	a,c	c,s			
Mimosaceae	*Acacia sp.*	-										
Mimosaceae	*Acacia stipuligera*	-		d	c							

Mimosaceae	*Acacia tenuissima*	Narrow-leaved Wattle										a
Mimosaceae	*Acacia tropica*	-										
Mimosaceae	*Archidendropsis basaltica*											
Moraceae	*Ficus rubiginosa forma glabrescens*	a Fig										
Myoporaceae	*Eremophila longifolia*											
Myoporaceae	*Eremophila sp.*	an Emubush										
Myoporaceae	*Myoporum acuminatum*	Waterbush										
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush										
Myrtaceae	*Calytrix microcoma*	Turkey Bush										
Myrtaceae	*Corymbia brachycarpa*	a Bloodwood	s		s							a
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum			a,s							a,c
Myrtaceae	*Corymbia leichhardtii*	Yellowjacket				d	s		d,s			
Myrtaceae	*Corymbia plena*	a Bloodwood										
Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood										
Myrtaceae	*Eucalyptus brownii*	Reid River Box								c	c	
Myrtaceae	*Eucalyptus camaldulensis*											
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark										
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark		d	a,d			a,c				c
Myrtaceae	*Eucalyptus exilipes*	Fine-leaved Ironbark										
Myrtaceae	*Eucalyptus fibrosa*	Broad-leaved Ironbark										
Myrtaceae	*Eucalyptus lamprophylla*	Shiny-leaved Bloodwood										
Myrtaceae	*Eucalyptus mediocris*											
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark								a,c	a,c	
Myrtaceae	*Eucalyptus persistens*	-										
Myrtaceae	*Eucalyptus similis*	Inland Yellow Jacket		a								

Myrtaceae	*Eucalyptus spp. mixed specimen*	a mallee eucalypt										
Myrtaceae	*Eucalyptus teretecornis*	Forest Red Gum										
Myrtaceae	*Homoranthus thomasii*											
Myrtaceae	*Lithomyrtus microphylla*											
Myrtaceae	*Melaleuca bracteata*	Black Tea-tree										
Myrtaceae	*Melaleuca chisholmii*	A paper bark										
Myrtaceae	*Melaleuca minutifolia*	-										
Myrtaceae	*Melaleuca nervosa*	a Paperbark			a							
Myrtaceae	*Melaleuca pallescens*	a Paperbark										
Myrtaceae	*Melaleuca sp.*	a Paperbark										
Myrtaceae	*Melaleuca tamariscina*	a Paperbark										
Myrtaceae	*Thryptomene parviflora*											
Nyctaginaceae	*Boerhavia sp.*											
Oleaceae	*Jasminum didymum*											
Oleaceae	*Jasminum lineare*	-										
Onagraceae	*Ludwigia octovalvis*	Native Willow Primrose										
Pentapetaceae	*Melhania ovata*											
Phormiaceae	*Dianella longifolia*	Blueberry Lily										
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush										
Phyllanthaceae	*Phyllanthus collinus*											
Phyllanthaceae	*Phyllanthus fuernrohrii*											
Phyllanthaceae	*Phyllanthus maderaspatensis*											
Phyllanthaceae	*Phyllanthus sp.*	-										
Phyllanthaceae	*Phyllanthus virgatus*	-										
Phyllanthaceae	*Sauropus elachophyllus*						a				a	
Picrodendraceae	*Petalostigma banksii*	Smooth-leaved Quinine										
Picrodendraceae	*Petalostigma pubescens*	Quinine Bush			a						a	

Pittosporaceae	*Bursaria incana*	Mock Orange, Prickly Pine							a			a
Poaceae	*Allopteropsis semialata*	Cockatoo Grass										
Poaceae	*Ancistrachne uncinulata*	Hooky Grass										
Poaceae	*Aristida caput-medusae*											
Poaceae	*Aristida holathera*											
Poaceae	*Aristida ingrata*	a Threeawn Grass		c	a	a	a					
Poaceae	*Aristida pruinosa*	a Threeawn Grass		c	a	a		a		a	a,s	
Poaceae	*Aristida sp.*		a									
Poaceae	*Arundinella nepalensis*	-										
Poaceae	*Bothriochloa bladhii var. bladhii*	Forest Bluegrass										
Poaceae	*Bothriochloa decipiens var. cloncurrensis*	Pitted Bluegrass										
Poaceae	*Bothriochloa ewartiana*	Desert Bluegrass								a	a	a
Poaceae	*Bothriochloa sp.*											
Poaceae	*Capillipedium parviflorum*	Scented-top Grass										
Poaceae	*Cenchrus ciliaris**	Buffel Grass								c	c	
Poaceae	*Cleistochloa subjuncea*	-	d	a	a		c	s	d			
Poaceae	*Cymbopogon bombycinus*	a Lemongrass									s	a
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass										
Poaceae	*Cynodon dactylon**	Couch Grass								a		
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass										
Poaceae	*Digitaria ammophila*	Silky Umbrella-grass										
Poaceae	*Digitaria breviglumis*		a									
Poaceae	*Digitaria ciliaris**	a Cockatoo Grass										
Poaceae	*Digitaria diminuta*	-										
Poaceae	*Digitaria gibbosa*											

Poaceae	*Echinochloa colona*	Awnless Barnyard Grass								a		
Poaceae	*Enneapogon lindleyanus*											
Poaceae	*Enneapogon polyphyllus*	-										
Poaceae	*Enneapogon robustissimus*	a Hedgehog Grass		a								
Poaceae	*Enneapogon sp.*			a								
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass									a	
Poaceae	*Eragrostis brownii*	Brown's Lovegrass										
Poaceae	*Eragrostis elongata*	Clustered Lovegrass								a	a	
Poaceae	*Eragrostis leptocarpa*											
Poaceae	*Eragrostis sororia*	a Lovegrass			a						a	
Poaceae	*Eragrostis sp.*											
Poaceae	*Eragrostis spartinoides*	a Lovegrass										
Poaceae	*Eragrostis speciosa*											
Poaceae	*Eriachne obtusa*	Northern Wandarrie Grass										
Poaceae	*Eulalia aurea*	-										
Poaceae	*Eulalia fulva*	Silky Browntop										
Poaceae	*Heteropogon contortus*	Black Speargrass		c	c	c				c	a	s
Poaceae	*Imperata cylindrica*	Bladey Grass										
Poaceae	*Leptochloa decipiens*											
Poaceae	*Leptochloa fusca subsp. fusca*	Brown Beetle Grass										
Poaceae	*Melinis repens**	Red Natal Grass			a							
Poaceae	*Panicum effusum*	Hairy Panic		a	a	a		a			s	a
Poaceae	*Panicum larcomianum*	-								a		
Poaceae	*Panicum simile*											
Poaceae	*Panicum sp.*											

Poaceae	*Paspalidium caespitosum*	Brigalow Grass										
Poaceae	*Paspalidium distans*	-										
Poaceae	*Paspalum scrobiculatum*											
Poaceae	*Perotis rara*	Comet Grass										
Poaceae	*Sarga timorense*	-				a						
Poaceae	*Schizachyrium fragile*	Fire Grass		s		a						
Poaceae	*Sehima nervosum*	Rat's-tail Grass										s
Poaceae	*Setaria surgens*	-										
Poaceae	*Sporobolus caroli*	Yakka Grass										
Poaceae	*Themeda avenacea*	Oat Kangaroo Grass									a	
Poaceae	*Themeda triandra*	Kangaroo Grass		c	c	c				c	c	d
Poaceae	*Triodia longiceps*	Giant Grey Spinifex	s	a	a	c	c	d				
Poaceae	*Triodia molesta*											
Poaceae	*Triodia pungens*	-										
Poaceae	*Urochloa piligera*	Hairy Armgrass										
Polygalaceae	*Comesperma sp.*	-										
Polygonaceae	*Comesperma pallidum*	-						s	a			
Polygonaceae	*Persicaria sp. (insufficient material)*	a Knotweed										
Proteaceae	*Grevillea decora*							c				
Proteaceae	*Grevillea glauca*	Bushman's Clothes Pegs										
Proteaceae	*Grevillea parallela*											
Proteaceae	*Grevillea pteridifolia*	Darwin Silky Oak										
Proteaceae	*Grevillea sessilis*	Silky Oak										
Proteaceae	*Hakea lorea*	Bootlace Oak										
Proteaceae	*Persoonia falcata*											
Proteaceae	*Persoonia sp.*	a Geebung				a						

Rhamnaceae	*Alphitonia excelsa*	Red Ash							a			
Rhamnaceae	*Ventilago viminalis*	Supple Jack								c	a	a
Rubiaceae	*Everistia vacciniifolia var. vacciniifolia*	-					a					
Rubiaceae	*Pogonolobus reticulatus*											
Rubiaceae	*Psydrax attenuata*											
Rubiaceae	*Spermacoce brachystema*										a	
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood										
Rutaceae	*Geijera salicifolia*	Scrub Wilga										
Rutaceae	*Phebalium glandulosum*	Desert Phebalium					d					
Santalaceae	*Santalum lanceolatum*	Northern Sandlewood	a									
Sapindaceae	*Atalaya hemiglauca*	Whitewood									c	
Sapindaceae	*Atalaya sp.*	-										a
Sapindaceae	*Distichostemon dodecandra*	a Hopbush	a									
Sapindaceae	*Dodonaea filifolia*	a Hopbush										
Sapindaceae	*Dodonaea lanceolata*	a Hopbush				d						
Scrophulariaceae	*Eremophila mitchellii*	False Sandalwood										
Scrophulariaceae	*Scoparia dulcis*	Goatweed										
Solanaceae	*Solanum ferocissimum*	Spiny Potato Bush							a			
Solanaceae	*Solanum parviflorum*	-									a	
Solanaceae	*Solanum sp.*	-										
Sparrmanniaceae	*Grewia retusifolia*	Dog's Balls		a		a				a	a,c	a
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia										
Stylidiaceae	*Stylidium eriorhizum*	-										a
Violaceae	*Hybanthus enneaspermus*	Blue Spade Flower										
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	a Grass Tree										

Plant Species List and Quadrat Data - Quadrats 21 to 30												
Family	**Scientific Name**	**Common Name**	**Q21**	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
Acanthaceae	*Brunoniella australis*	Blue Trumpet				a		a				
Acanthaceae	*Pseuderanthemum variabile*											
Acanthaceae	*Rostellularia adscendens*	-										
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern							c			
Adiantaceae	*Cheilanthes sieberi*	-										
Amaranthaceae	*Achyranthes aspera*	Chaff Flower			a	a						
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed					a					
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed			a							
Anthericaceae	*Tricoryne anceps*	-										
Apiaceae	*Eryngium plantagineum*	Long Eryngium					a					
Apiaceae	*Platysace valida*											
Apocynaceae	*Alstonia constricta*											
Apocynaceae	*Carissa lanceolata*	Currant Bush			a	a,c			a			
Apocynaceae	*Carissa ovata*	Currant Bush										
Apocynaceae	*Marsdenia microlepis*	-										
Apocynaceae	*Parsonsia eucalyptophylla*	Gargaloo							a			
Apocynaceae	*Parsonsia lanceolata*											
Asteraceae	*Calotis sp.*	a Burr-daisy										
Asteraceae	*Camptacra barbata*	-										
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting										
Asteraceae	*Coronidium glutinosum*			c								
Asteraceae	*Cyanthillium cinereum*											
Asteraceae	*Emilia sonchifolia*	Lilac Tasselflower	a									
Asteraceae	*Epaltes australis**	-						a				
Asteraceae	*Parthenium hysterophorus*											

Asteraceae	*Peripleura bicolor*											
Asteraceae	*Peripleura virgata*	-										
Asteraceae	*Pterocaulon redolens*	Rag Weed, Pintye-Pintye				a						
Asteraceae	*Pterocaulon serrulatum*											
Asteraceae	*Rutidosis leucantha*											
Asteraceae	*Senecio brigalowensis*											
Asteraceae	*Vittadinia pustulata*	a Fuzzweed										
Asteraceae	*Wedelia spilanthoides*											
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine							a			
Boraginaceae	*Heliotropium sp.*											
Byttneriaceae	*Keraudrenia collina*	-										
Byttneriaceae	*Waltheria indica*											
Caesalpiniaceae	*Chamaecrista absus*											
Caesalpiniaceae	*Chamaecrista concinna*	-										
Caesalpiniaceae	*Chamaecrista mimosoides*		a									
Caesalpiniaceae	*Chamaecrista nomame*											
Caesalpiniaceae	*Lysiphyllum carronii*											
Caesalpiniaceae	*Senna costata*	-										
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell										
Campanulaceae	*Wahlenbergia gracilis*	a Bluebell				a						
Campanulaceae	*Wahlenbergia sp.*											
Capparaceae	*Capparis canescens*	-										
Capparaceae	*Capparis lasiantha*	Nepine										
Caryophyllaceae	*Polycarpaea corymbosa*											
Celastraceae	*Maytenus cunninghamii*	Western Rosewood						a				
Chenopodiaceae	*Einadia nutans*	climbing saltbush			a							

Clusiaceae	*Hypericum gramineum*	Small St John's Wort										
Combretaceae	*Terminalia oblongata*	Yellow-wood										
Convolvulaceae	*Evolvulus alsinoides*											
Convolvulaceae	*Ipomoea sp.*		a									
Cyperaceae	*Abildgaardia ovata*											a
Cyperaceae	*Bulbostylis barbata*	Watergrass										
Cyperaceae	*Cyperus conicus*	-	a									
Cyperaceae	*Cyperus difformis*	Dirty Dora					a					
Cyperaceae	*Cyperus flaccidus*	Lax Flat-sedge					a		a			
Cyperaceae	*Cyperus fulvus*	Sticky Sedge										
Cyperaceae	*Cyperus gracilis*											
Cyperaceae	*Cyperus holoschoenus*											
Cyperaceae	*Cyperus lucidus*	Leafy Flat Sedge										
Cyperaceae	*Eleocharis plana*	Flat Spike-sedge					s					
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge			a							
Cyperaceae	*Gahnia aspera*	Saw Sedge										
Cyperaceae	*Schoenoplectus dissachanthus*	Blunt Club-sedge					a					
Cyperaceae	*Schoenoplectus lateriflorus*	-					a					
Cyperaceae	*Schoenus kennyi*	-										a
Cyperaceae	*Scleria mackaviensis*											
Cyperaceae	*Scleria sphacelata*								a			
Cyperaceaee	*Cyperus perangustus*	Umbrella Sedge			a	a						
Droseraceae	*Drosera burmanni*	a Sundew										
Droseraceae	*Drosera indica*	Flycatcher	a									
Euphorbiaceae	*Beyeria viscosa*	a Wallaby Bush							d			
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed										
Euphorbiaceae	*Euphorbia mitchelliana*	a Spurge										

Fabaceae	*Aeschynomene indica*						a					
Fabaceae	*Cajanus marmoratus*	-										
Fabaceae	*Crotalaria medicaginea*											
Fabaceae	*Crotalaria mitchellii subsp. mitchellii*	Yellow Rattlepod										
Fabaceae	*Crotalaria montana*	a Rattlepod	a									
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil										
Fabaceae	*Desmodium varians*	Slender Tick-trefoil										
Fabaceae	*Erythrina verspetilio*	Native Coral Tree										
Fabaceae	*Galactia tenuiflora*	a Lovecreeper										
Fabaceae	*Gastrolobium grandiflorum*	Heart-leaf Poison Bush										
Fabaceae	*Glycine clandestina*	a Lovecreeper				a						
Fabaceae	*Glycine sp. (Mackay SBAndrews+43)*											
Fabaceae	*Glycine tomentella*	a Lovecreeper										
Fabaceae	*Hovea parvicalyx*	-		c								
Fabaceae	*Indigo linifolia*	Narrow-leaf Indigo										
Fabaceae	*Indigofera colutea*											
Fabaceae	*Indigofera haplophylla*											
Fabaceae	*Indigofera hirsuta*	Hairy Indigo										
Fabaceae	*Indigofera linifolia*	-						a				
Fabaceae	*Indigofera linnaei*	Birdsville Indigo				a		a				
Fabaceae	*Indigofera pratensis*							a				
Fabaceae	*Indigofera sp. (Aramac E.J.Thompson+ JER177*	-							a			
Fabaceae	*Jacksonia ramosissima*	a Dogwood		s							d	
Fabaceae	*Jacksonia rhadinoclada*											
Fabaceae	*Labichea rupestris*	-									a	
Fabaceae	*Mirbelia aotoides*											a

Fabaceae	*Mirbelia viminalis*											d,s
Fabaceae	*Rhynchosia minima*							a				
Fabaceae	*Stylosanthes scabra**	a Rattlepod			a	a			a			
Fabaceae	*Tephrosia brachyodon*	-		c								
Fabaceae	*Tephrosia juncea*	-										
Fabaceae	*Tephrosia leptoclada*											
Fabaceae	*Uraria lagopodioides*	Prickitch						a				
Fabaceae	*Vigna lanceolata*	Maloga Bean										
Fabaceae	*Zornia areolata*					a						
Fabaceae	*Zornia dyctiocarpa var. Filifolia*											
Gentiaceae	*Schenkia australis*	-										
Goodeniaceae	*Goodenia armitiana*											
Goodeniaceae	*Goodenia gracilis*	Slender Goodenia					a					
Goodeniaceae	*Goodenia grandiflora*	-							a			
Goodeniaceae	*Goodenia hederacea*											
Goodeniaceae	*Goodenia sp.*	-										
Goodeniaceae	*Goodenia splendida*	-									a	
Haloragaceae	*Gonocarpus sp.*											
Juncaceae	*Juncus continuus*	-			c							
Lamiaceae	*Prostanthera parviflora*	-										
Lauraceae	*Cassytha filiformis*											
Lauraceae	*Cassytha glabella*											
Lobeliaceae	*Pratia purpurascens*	Whiteroot	a		a	a						
Lomandraceae	*Lomandra leucocephala*	Woolly Mat-rush										
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	c									
Lomandraceae	*Lomandra multiflora*	Many Flowered Matrush										
Loranthaceae	*Amyema quandang*											

Lythraceae	*Rotala mexicana*	-										
Malvaceae	*Hibiscus meraukensis*											
Malvaceae	*Sida cordifolia**											
Malvaceae	*Sida cunninghamiana*	Ridged Sida		c	a							
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne			a	a						
Malvaceae	*Sida spinosa**	Arrow-leaf Sida				a						
Marsileaceae	*Marsilea hirsuta*	Hansen's Nardoo					a					
Mimosaceae	*Acacia cowleana*	Halls Creek Wattle		c				c				
Mimosaceae	*Acacia dietrichiana*										a	
Mimosaceae	*Acacia elachantha*	-										
Mimosaceae	*Acacia excelsa*	-				c						
Mimosaceae	*Acacia farnesiana*											
Mimosaceae	*Acacia galioides*	-										
Mimosaceae	*Acacia gnidium*	-										
Mimosaceae	*Acacia holosericea*	Soapbush Wattle			d			c				
Mimosaceae	*Acacia hyaloneura*	-										
Mimosaceae	*Acacia laccata*	-			a							
Mimosaceae	*Acacia leptostachya*	Townsville Wattle									a	
Mimosaceae	*Acacia longispicata*											
Mimosaceae	*Acacia melleodora*											
Mimosaceae	*Acacia multisiliqua*											
Mimosaceae	*Acacia platycarpa*	-										
Mimosaceae	*Acacia ramiflora*	-										
Mimosaceae	*Acacia sericophylla*	-						s				
Mimosaceae	*Acacia shirleyi*			c					c	c		c,s
Mimosaceae	*Acacia sp.*	-			a							
Mimosaceae	*Acacia stipuligera*	-										d

Mimosaceae	*Acacia tenuissima*	Narrow-leaved Wattle						c				
Mimosaceae	*Acacia tropica*	-										
Mimosaceae	*Archidendropsis basaltica*											
Moraceae	*Ficus rubiginosa forma glabrescens*	a Fig							a			
Myoporaceae	*Eremophila longifolia*											
Myoporaceae	*Eremophila sp.*	an Emubush				c						
Myoporaceae	*Myoporum acuminatum*	Waterbush										
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush										
Myrtaceae	*Calytrix microcoma*	Turkey Bush									a	
Myrtaceae	*Corymbia brachycarpa*	a Bloodwood	a	a,s								
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum						s				
Myrtaceae	*Corymbia leichhardtii*	Yellowjacket							s		d	
Myrtaceae	*Corymbia plena*	a Bloodwood										
Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood										
Myrtaceae	*Eucalyptus brownii*	Reid River Box	c			d,s	d					
Myrtaceae	*Eucalyptus camaldulensis*											
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark										
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark	c					a,d				c
Myrtaceae	*Eucalyptus exilipes*	Fine-leaved Ironbark										
Myrtaceae	*Eucalyptus fibrosa*	Broad-leaved Ironbark										
Myrtaceae	*Eucalyptus lamprophylla*	Shiny-leaved Bloodwood										
Myrtaceae	*Eucalyptus mediocris*											
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark	a									
Myrtaceae	*Eucalyptus persistens*	-							c			
Myrtaceae	*Eucalyptus similis*	Inland Yellow Jacket		a,c		a						

Myrtaceae	*Eucalyptus spp. mixed specimen*	a mallee eucalypt								c		
Myrtaceae	*Eucalyptus teretecornis*	Forest Red Gum										
Myrtaceae	*Homoranthus thomasii*									a		
Myrtaceae	*Lithomyrtus microphylla*											
Myrtaceae	*Melaleuca bracteata*	Black Tea-tree										
Myrtaceae	*Melaleuca chisholmii*	A paper bark							a			
Myrtaceae	*Melaleuca minutifolia*	-										
Myrtaceae	*Melaleuca nervosa*	a Paperbark										
Myrtaceae	*Melaleuca pallescens*	a Paperbark										
Myrtaceae	*Melaleuca sp.*	a Paperbark										
Myrtaceae	*Melaleuca tamariscina*	a Paperbark									a	
Myrtaceae	*Thryptomene parviflora*											
Nyctaginaceae	*Boerhavia sp.*											
Oleaceae	*Jasminum didymum*											
Oleaceae	*Jasminum lineare*	-										
Onagraceae	*Ludwigia octovalvis*	Native Willow Primrose			a							
Pentapetaceae	*Melhania ovata*											
Phormiaceae	*Dianella longifolia*	Blueberry Lily	a					a				
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush										
Phyllanthaceae	*Phyllanthus collinus*					a						
Phyllanthaceae	*Phyllanthus fuernrohrii*											
Phyllanthaceae	*Phyllanthus maderaspatensis*											
Phyllanthaceae	*Phyllanthus sp.*	-										
Phyllanthaceae	*Phyllanthus virgatus*	-										
Phyllanthaceae	*Sauropus elachophyllus*											
Picrodendraceae	*Petalostigma banksii*	Smooth-leaved Quinine										a
Picrodendraceae	*Petalostigma pubescens*	Quinine Bush		a								

Pittosporaceae	*Bursaria incana*	Mock Orange, Prickly Pine										
Poaceae	*Allopteropsis semialata*	Cockatoo Grass										
Poaceae	*Ancistrachne uncinulata*	Hooky Grass							c			
Poaceae	*Aristida caput-medusae*											
Poaceae	*Aristida holathera*											
Poaceae	*Aristida ingrata*	a Threeawn Grass			a	a						a
Poaceae	*Aristida pruinosa*	a Threeawn Grass		a	a	a		a				
Poaceae	*Aristida sp.*											a
Poaceae	*Arundinella nepalensis*	-			a							a
Poaceae	*Bothriochloa bladhii var. bladhii*	Forest Bluegrass	a									
Poaceae	*Bothriochloa decipiens var. cloncurrensis*	Pitted Bluegrass			a	c						
Poaceae	*Bothriochloa ewartiana*	Desert Bluegrass										
Poaceae	*Bothriochloa sp.*											
Poaceae	*Capillipedium parviflorum*	Scented-top Grass	a		s							
Poaceae	*Cenchrus ciliaris**	Buffel Grass			s	s		c				
Poaceae	*Cleistochloa subjuncea*	-		c						a		a
Poaceae	*Cymbopogon bombycinus*	a Lemongrass				a			a			
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass										
Poaceae	*Cynodon dactylon**	Couch Grass			c							
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass	a			a		a				
Poaceae	*Digitaria ammophila*	Silky Umbrella-grass										
Poaceae	*Digitaria breviglumis*											
Poaceae	*Digitaria ciliaris**	a Cockatoo Grass										
Poaceae	*Digitaria diminuta*	-							a			
Poaceae	*Digitaria gibbosa*											

Poaceae	*Echinochloa colona*	Awnless Barnyard Grass										
Poaceae	*Enneapogon lindleyanus*					a			a			
Poaceae	*Enneapogon polyphyllus*	-										a
Poaceae	*Enneapogon robustissimus*	a Hedgehog Grass										
Poaceae	*Enneapogon sp.*											
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass										
Poaceae	*Eragrostis brownii*	Brown's Lovegrass										
Poaceae	*Eragrostis elongata*	Clustered Lovegrass			a				a			
Poaceae	*Eragrostis leptocarpa*											
Poaceae	*Eragrostis sororia*	a Lovegrass	a			a						
Poaceae	*Eragrostis sp.*											
Poaceae	*Eragrostis spartinoides*	a Lovegrass										
Poaceae	*Eragrostis speciosa*											
Poaceae	*Eriachne obtusa*	Northern Wandarrie Grass										
Poaceae	*Eulalia aurea*	-					s					
Poaceae	*Eulalia fulva*	Silky Browntop	a									
Poaceae	*Heteropogon contortus*	Black Speargrass	c		c	c		a				
Poaceae	*Imperata cylindrica*	Bladey Grass										
Poaceae	*Leptochloa decipiens*											
Poaceae	*Leptochloa fusca subsp. fusca*	Brown Beetle Grass					d					
Poaceae	*Melinis repens**	Red Natal Grass	a		a	a						
Poaceae	*Panicum effusum*	Hairy Panic	a		a	a		a				
Poaceae	*Panicum larcomianum*	-					a					
Poaceae	*Panicum simile*											a
Poaceae	*Panicum sp.*											

Poaceae	*Paspalidium caespitosum*	Brigalow Grass										
Poaceae	*Paspalidium distans*	-							s			
Poaceae	*Paspalum scrobiculatum*											
Poaceae	*Perotis rara*	Comet Grass										
Poaceae	*Sarga timorense*	-	a									
Poaceae	*Schizachyrium fragile*	Fire Grass										
Poaceae	*Sehima nervosum*	Rat's-tail Grass	c									
Poaceae	*Setaria surgens*	-										
Poaceae	*Sporobolus caroli*	Yakka Grass							a			
Poaceae	*Themeda avenacea*	Oat Kangaroo Grass						a				
Poaceae	*Themeda triandra*	Kangaroo Grass	c			c		c				
Poaceae	*Triodia longiceps*	Giant Grey Spinifex		c						d	d	
Poaceae	*Triodia molesta*											
Poaceae	*Triodia pungens*	-										d
Poaceae	*Urochloa piligera*	Hairy Armgrass	a									
Polygalaceae	*Comesperma sp.*	-									a	
Polygonaceae	*Comesperma pallidum*	-										s
Polygonaceae	*Persicaria sp. (insufficient material)*	a Knotweed										
Proteaceae	*Grevillea decora*									c	s	
Proteaceae	*Grevillea glauca*	Bushman's Clothes Pegs										
Proteaceae	*Grevillea parallela*											
Proteaceae	*Grevillea pteridifolia*	Darwin Silky Oak		a								
Proteaceae	*Grevillea sessilis*	Silky Oak									a	d
Proteaceae	*Hakea lorea*	Bootlace Oak						a				
Proteaceae	*Persoonia falcata*											
Proteaceae	*Persoonia sp.*	a Geebung										

Rhamnaceae	*Alphitonia excelsa*	Red Ash										
Rhamnaceae	*Ventilago viminalis*	Supple Jack										
Rubiaceae	*Everistia vacciniifolia var. vacciniifolia*	-						a				
Rubiaceae	*Pogonolobus reticulatus*											
Rubiaceae	*Psydrax attenuata*											
Rubiaceae	*Spermacoce brachystema*					a						
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood										
Rutaceae	*Geijera salicifolia*	Scrub Wilga							a			
Rutaceae	*Phebalium glandulosum*	Desert Phebalium										
Santalaceae	*Santalum lanceolatum*	Northern Sandlewood								a		
Sapindaceae	*Atalaya hemiglauca*	Whitewood				c						
Sapindaceae	*Atalaya sp.*	-										
Sapindaceae	*Distichostemon dodecandra*	a Hopbush										
Sapindaceae	*Dodonaea filifolia*	a Hopbush										
Sapindaceae	*Dodonaea lanceolata*	a Hopbush										
Scrophulariaceae	*Eremophila mitchellii*	False Sandalwood										
Scrophulariaceae	*Scoparia dulcis*	Goatweed										
Solanaceae	*Solanum ferocissimum*	Spiny Potato Bush							a			
Solanaceae	*Solanum parviflorum*	-										
Solanaceae	*Solanum sp.*	-										
Sparrmanniaceae	*Grewia retusifolia*	Dog's Balls	d			a		s	a			
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia										
Stylidiaceae	*Stylidium eriorhizum*	-										
Violaceae	*Hybanthus enneaspermus*	Blue Spade Flower										
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	a Grass Tree										

Plant Species List and Quadrat Data - Quadrats 31 to 40												
Family	**Scientific Name**	**Common Name**	**Q31**	**Q32**	**Q33**	**Q34**	**Q35**	**Q36**	**Q37**	**Q38**	**Q39**	**Q40**
Acanthaceae	*Brunoniella australis*	Blue Trumpet							a		s	
Acanthaceae	*Pseuderanthemum variabile*					a						
Acanthaceae	*Rostellularia adscendens*	-							a	a		
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern										
Adiantaceae	*Cheilanthes sieberi*	-				a						
Amaranthaceae	*Achyranthes aspera*	Chaff Flower				a						
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed										
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed										
Anthericaceae	*Tricoryne anceps*	-			a							
Apiaceae	*Eryngium plantagineum*	Long Eryngium										
Apiaceae	*Platysace valida*											
Apocynaceae	*Alstonia constricta*											
Apocynaceae	*Carissa lanceolata*	Currant Bush										
Apocynaceae	*Carissa ovata*	Currant Bush				d						
Apocynaceae	*Marsdenia microlepis*	-										
Apocynaceae	*Parsonsia eucalyptophylla*	Gargaloo										
Apocynaceae	*Parsonsia lanceolata*									a		
Asteraceae	*Calotis sp.*	a Burr-daisy										
Asteraceae	*Camptacra barbata*	-										
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting										
Asteraceae	*Coronidium glutinosum*											
Asteraceae	*Cyanthillium cinereum*											
Asteraceae	*Emilia sonchifolia*	Lilac Tasselflower										
Asteraceae	*Epaltes australis**	-										
Asteraceae	*Parthenium hysterophorus*											

Asteraceae	*Peripleura bicolor*											
Asteraceae	*Peripleura virgata*	-										
Asteraceae	*Pterocaulon redolens*	Rag Weed, Pintye-Pintye										
Asteraceae	*Pterocaulon serrulatum*											a
Asteraceae	*Rutidosis leucantha*									a		
Asteraceae	*Senecio brigalowensis*											
Asteraceae	*Vittadinia pustulata*	a Fuzzweed										
Asteraceae	*Wedelia spilanthoides*									a		
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine										
Boraginaceae	*Heliotropium sp.*										a	
Byttneriaceae	*Keraudrenia collina*	-										
Byttneriaceae	*Waltheria indica*											
Caesalpiniaceae	*Chamaecrista absus*											
Caesalpiniaceae	*Chamaecrista concinna*	-										
Caesalpiniaceae	*Chamaecrista mimosoides*											
Caesalpiniaceae	*Chamaecrista nomame*											
Caesalpiniaceae	*Lysiphyllum carronii*					c						
Caesalpiniaceae	*Senna costata*	-				a						
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell										
Campanulaceae	*Wahlenbergia gracilis*	a Bluebell										
Campanulaceae	*Wahlenbergia sp.*											
Capparaceae	*Capparis canescens*	-							a			
Capparaceae	*Capparis lasiantha*	Nepine				a						
Caryophyllaceae	*Polycarpaea corymbosa*											
Celastraceae	*Maytenus cunninghamii*	Western Rosewood							a			a,d
Chenopodiaceae	*Einadia nutans*	climbing saltbush										

Clusiaceae	*Hypericum gramineum*	Small St John's Wort										
Combretaceae	*Terminalia oblongata*	Yellow-wood				a						
Convolvulaceae	*Evolvulus alsinoides*											
Convolvulaceae	*Ipomoea sp.*											
Cyperaceae	*Abildgaardia ovata*		a									
Cyperaceae	*Bulbostylis barbata*	Watergrass										
Cyperaceae	*Cyperus conicus*	-							a			
Cyperaceae	*Cyperus difformis*	Dirty Dora										
Cyperaceae	*Cyperus flaccidus*	Lax Flat-sedge										
Cyperaceae	*Cyperus fulvus*	Sticky Sedge										
Cyperaceae	*Cyperus gracilis*											
Cyperaceae	*Cyperus holoschoenus*											
Cyperaceae	*Cyperus lucidus*	Leafy Flat Sedge										
Cyperaceae	*Eleocharis plana*	Flat Spike-sedge		d								
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge										
Cyperaceae	*Gahnia aspera*	Saw Sedge										
Cyperaceae	*Schoenoplectus dissachanthus*	Blunt Club-sedge										
Cyperaceae	*Schoenoplectus lateriflorus*	-		a								
Cyperaceae	*Schoenus kennyi*	-						a				
Cyperaceae	*Scleria mackaviensis*											
Cyperaceae	*Scleria sphacelata*											
Cyperaceaee	*Cyperus perangustus*	Umbrella Sedge										
Droseraceae	*Drosera burmanni*	a Sundew										
Droseraceae	*Drosera indica*	Flycatcher										
Euphorbiaceae	*Beyeria viscosa*	a Wallaby Bush										
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed										
Euphorbiaceae	*Euphorbia mitchelliana*	a Spurge										

Fabaceae	*Aeschynomene indica*											
Fabaceae	*Cajanus marmoratus*	-										
Fabaceae	*Crotalaria medicaginea*											
Fabaceae	*Crotalaria mitchellii subsp. mitchellii*	Yellow Rattlepod										
Fabaceae	*Crotalaria montana*	a Rattlepod										
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil							a			
Fabaceae	*Desmodium varians*	Slender Tick-trefoil										
Fabaceae	*Erythrina verspetilio*	Native Coral Tree									a	
Fabaceae	*Galactia tenuiflora*	a Lovecreeper							a		a	
Fabaceae	*Gastrolobium grandiflorum*	Heart-leaf Poison Bush			a							
Fabaceae	*Glycine clandestina*	a Lovecreeper										
Fabaceae	*Glycine sp. (Mackay SBAndrews+43)*		a									
Fabaceae	*Glycine tomentella*	a Lovecreeper	a									a
Fabaceae	*Hovea parvicalyx*	-										
Fabaceae	*Indigo linifolia*	Narrow-leaf Indigo									a	
Fabaceae	*Indigofera colutea*											
Fabaceae	*Indigofera haplophylla*								d			
Fabaceae	*Indigofera hirsuta*	Hairy Indigo										
Fabaceae	*Indigofera linifolia*	-										a
Fabaceae	*Indigofera linnaei*	Birdsville Indigo										
Fabaceae	*Indigofera pratensis*									a	a,d	
Fabaceae	*Indigofera sp. (Aramac E.J.Thompson+ JER177*	-										
Fabaceae	*Jacksonia ramosissima*	a Dogwood										
Fabaceae	*Jacksonia rhadinoclada*											
Fabaceae	*Labichea rupestris*	-										
Fabaceae	*Mirbelia aotoides*							a				

Fabaceae	*Mirbelia viminalis*											
Fabaceae	*Rhynchosia minima*											
Fabaceae	*Stylosanthes scabra**	a Rattlepod								a	a	a
Fabaceae	*Tephrosia brachyodon*	-										
Fabaceae	*Tephrosia juncea*	-							a		a	
Fabaceae	*Tephrosia leptoclada*											
Fabaceae	*Uraria lagopodioides*	Prickitch										
Fabaceae	*Vigna lanceolata*	Maloga Bean										
Fabaceae	*Zornia areolata*											
Fabaceae	*Zornia dyctiocarpa var. Filifolia*											
Gentiaceae	*Schenkia australis*	-										
Goodeniaceae	*Goodenia armitiana*									a		
Goodeniaceae	*Goodenia gracilis*	Slender Goodenia		a								
Goodeniaceae	*Goodenia grandiflora*	-										
Goodeniaceae	*Goodenia hederacea*											
Goodeniaceae	*Goodenia sp.*	-										
Goodeniaceae	*Goodenia splendida*	-										
Haloragaceae	*Gonocarpus sp.*										a	a
Juncaceae	*Juncus continuus*	-										
Lamiaceae	*Prostanthera parviflora*	-										
Lauraceae	*Cassytha filiformis*											
Lauraceae	*Cassytha glabella*											
Lobeliaceae	*Pratia purpurascens*	Whiteroot										
Lomandraceae	*Lomandra leucocephala*	Woolly Mat-rush										
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush							a			
Lomandraceae	*Lomandra multiflora*	Many Flowered Matrush										
Loranthaceae	*Amyema quandang*											

Lythraceae	*Rotala mexicana*	-										
Malvaceae	*Hibiscus meraukensis*											
Malvaceae	*Sida cordifolia*					a						
Malvaceae	*Sida cunninghamiana*	Ridged Sida				a			a			
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne										
Malvaceae	*Sida spinosa**	Arrow-leaf Sida										
Marsileaceae	*Marsilea hirsuta*	Hansen's Nardoo		a								
Mimosaceae	*Acacia cowleana*	Halls Creek Wattle										
Mimosaceae	*Acacia dietrichiana*											
Mimosaceae	*Acacia elachantha*	-										
Mimosaceae	*Acacia excelsa*	-										
Mimosaceae	*Acacia farnesiana*											a
Mimosaceae	*Acacia galioides*	-										
Mimosaceae	*Acacia gnidium*	-										
Mimosaceae	*Acacia holosericea*	Soapbush Wattle										
Mimosaceae	*Acacia hyaloneura*	-										
Mimosaceae	*Acacia laccata*	-			c	d	c			a		
Mimosaceae	*Acacia leptostachya*	Townsville Wattle										
Mimosaceae	*Acacia longispicata*									d		
Mimosaceae	*Acacia melleodora*		d									
Mimosaceae	*Acacia multisiliqua*											
Mimosaceae	*Acacia platycarpa*	-	d									
Mimosaceae	*Acacia ramiflora*	-										
Mimosaceae	*Acacia sericophylla*	-								a	a	
Mimosaceae	*Acacia shirleyi*							c				
Mimosaceae	*Acacia sp.*	-										
Mimosaceae	*Acacia stipuligera*	-			c							

Mimosaceae	*Acacia tenuissima*	Narrow-leaved Wattle	a									
Mimosaceae	*Acacia tropica*	-										a
Mimosaceae	*Archidendropsis basaltica*								d			
Moraceae	*Ficus rubiginosa forma glabrescens*	a Fig										
Myoporaceae	*Eremophila longifolia*											a
Myoporaceae	*Eremophila sp.*	an Emubush										
Myoporaceae	*Myoporum acuminatum*	Waterbush										
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush										
Myrtaceae	*Calytrix microcoma*	Turkey Bush										
Myrtaceae	*Corymbia brachycarpa*	a Bloodwood										
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum									a,d,s	a
Myrtaceae	*Corymbia leichhardtii*	Yellowjacket										
Myrtaceae	*Corymbia plena*	a Bloodwood										
Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood			d					d	a	
Myrtaceae	*Eucalyptus brownii*	Reid River Box		d		a,c						a,c
Myrtaceae	*Eucalyptus camaldulensis*											
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark							d			
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark	s		c		d	a,c				
Myrtaceae	*Eucalyptus exilipes*	Fine-leaved Ironbark										
Myrtaceae	*Eucalyptus fibrosa*	Broad-leaved Ironbark										
Myrtaceae	*Eucalyptus lamprophylla*	Shiny-leaved Bloodwood										
Myrtaceae	*Eucalyptus mediocris*											
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark								d,s		a,c
Myrtaceae	*Eucalyptus persistens*	-										
Myrtaceae	*Eucalyptus similis*	Inland Yellow Jacket	d		c						d	

Myrtaceae	*Eucalyptus spp. mixed specimen*	a mallee eucalypt										
Myrtaceae	*Eucalyptus teretecornis*	Forest Red Gum										
Myrtaceae	*Homoranthus thomasii*											
Myrtaceae	*Lithomyrtus microphylla*							d				
Myrtaceae	*Melaleuca bracteata*	Black Tea-tree										
Myrtaceae	*Melaleuca chisholmii*	A paper bark										
Myrtaceae	*Melaleuca minutifolia*	-					a	a				
Myrtaceae	*Melaleuca nervosa*	a Paperbark										
Myrtaceae	*Melaleuca pallescens*	a Paperbark										
Myrtaceae	*Melaleuca sp.*	a Paperbark										
Myrtaceae	*Melaleuca tamariscina*	a Paperbark										
Myrtaceae	*Thryptomene parviflora*											
Nyctaginaceae	*Boerhavia sp.*					a						
Oleaceae	*Jasminum didymum*					a						
Oleaceae	*Jasminum lineare*	-							a			
Onagraceae	*Ludwigia octovalvis*	Native Willow Primrose										
Pentapetaceae	*Melhania ovata*											a
Phormiaceae	*Dianella longifolia*	Blueberry Lily			a				a			
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush										
Phyllanthaceae	*Phyllanthus collinus*											a
Phyllanthaceae	*Phyllanthus fuernrohrii*											
Phyllanthaceae	*Phyllanthus maderaspatensis*										a	
Phyllanthaceae	*Phyllanthus sp.*	-										
Phyllanthaceae	*Phyllanthus virgatus*	-								a		
Phyllanthaceae	*Sauropus elachophyllus*											
Picrodendraceae	*Petalostigma banksii*	Smooth-leaved Quinine			a							
Picrodendraceae	*Petalostigma pubescens*	Quinine Bush	a									

Pittosporaceae	*Bursaria incana*	Mock Orange, Prickly Pine								a	a	
Poaceae	*Allopteropsis semialata*	Cockatoo Grass									a	
Poaceae	*Ancistrachne uncinulata*	Hooky Grass										
Poaceae	*Aristida caput-medusae*											
Poaceae	*Aristida holathera*											
Poaceae	*Aristida ingrata*	a Threeawn Grass					a		a	a	a	
Poaceae	*Aristida pruinosa*	a Threeawn Grass	a						a	a		a
Poaceae	*Aristida sp.*		a					c				
Poaceae	*Arundinella nepalensis*	-	a									
Poaceae	*Bothriochloa bladhii var. bladhii*	Forest Bluegrass										
Poaceae	*Bothriochloa decipiens var. cloncurrensis*	Pitted Bluegrass										
Poaceae	*Bothriochloa ewartiana*	Desert Bluegrass										
Poaceae	*Bothriochloa sp.*								a		s	
Poaceae	*Capillipedium parviflorum*	Scented-top Grass										
Poaceae	*Cenchrus ciliaris**	Buffel Grass								s	s	c
Poaceae	*Cleistochloa subjuncea*	-						a			a	
Poaceae	*Cymbopogon bombycinus*	a Lemongrass			a		c		c	a	a	
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass										
Poaceae	*Cynodon dactylon**	Couch Grass										
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass										
Poaceae	*Digitaria ammophila*	Silky Umbrella-grass										
Poaceae	*Digitaria breviglumis*											
Poaceae	*Digitaria ciliaris**	a Cockatoo Grass										
Poaceae	*Digitaria diminuta*	-										
Poaceae	*Digitaria gibbosa*											

Poaceae	*Echinochloa colona*	Awnless Barnyard Grass										
Poaceae	*Enneapogon lindleyanus*					a			a		a	
Poaceae	*Enneapogon polyphyllus*	-						a				
Poaceae	*Enneapogon robustissimus*	a Hedgehog Grass										
Poaceae	*Enneapogon sp.*											
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass										
Poaceae	*Eragrostis brownii*	Brown's Lovegrass										
Poaceae	*Eragrostis elongata*	Clustered Lovegrass										
Poaceae	*Eragrostis leptocarpa*											
Poaceae	*Eragrostis sororia*	a Lovegrass										
Poaceae	*Eragrostis sp.*											
Poaceae	*Eragrostis spartinoides*	a Lovegrass										
Poaceae	*Eragrostis speciosa*											
Poaceae	*Eriachne obtusa*	Northern Wandarrie Grass										
Poaceae	*Eulalia aurea*	-										
Poaceae	*Eulalia fulva*	Silky Browntop										
Poaceae	*Heteropogon contortus*	Black Speargrass	a						c		a	a
Poaceae	*Imperata cylindrica*	Bladey Grass										
Poaceae	*Leptochloa decipiens*											
Poaceae	*Leptochloa fusca subsp. fusca*	Brown Beetle Grass										
Poaceae	*Melinis repens**	Red Natal Grass										
Poaceae	*Panicum effusum*	Hairy Panic	a		a		a		a		a	a
Poaceae	*Panicum larcomianum*	-										
Poaceae	*Panicum simile*											
Poaceae	*Panicum sp.*											

Poaceae	*Paspalidium caespitosum*	Brigalow Grass										
Poaceae	*Paspalidium distans*	-										
Poaceae	*Paspalum scrobiculatum*											
Poaceae	*Perotis rara*	Comet Grass										
Poaceae	*Sarga timorense*	-										
Poaceae	*Schizachyrium fragile*	Fire Grass										
Poaceae	*Sehima nervosum*	Rat's-tail Grass										
Poaceae	*Setaria surgens*	-										
Poaceae	*Sporobolus caroli*	Yakka Grass				a	a					
Poaceae	*Themeda avenacea*	Oat Kangaroo Grass										
Poaceae	*Themeda triandra*	Kangaroo Grass	c		a				c	a	d	c
Poaceae	*Triodia longiceps*	Giant Grey Spinifex										
Poaceae	*Triodia molesta*											
Poaceae	*Triodia pungens*	-	c		d		c	c		d	a	
Poaceae	*Urochloa piligera*	Hairy Armgrass										
Polygalaceae	*Comesperma sp.*	-										
Polygonaceae	*Comesperma pallidum*	-	a		a		a	a			a	
Polygonaceae	*Persicaria sp. (insufficient material)*	a Knotweed										
Proteaceae	*Grevillea decora*											
Proteaceae	*Grevillea glauca*	Bushman's Clothes Pegs										
Proteaceae	*Grevillea parallela*											a
Proteaceae	*Grevillea pteridifolia*	Darwin Silky Oak										
Proteaceae	*Grevillea sessilis*	Silky Oak			a		c	a				
Proteaceae	*Hakea lorea*	Bootlace Oak										
Proteaceae	*Persoonia falcata*											
Proteaceae	*Persoonia sp.*	a Geebung										

Rhamnaceae	*Alphitonia excelsa*	Red Ash										
Rhamnaceae	*Ventilago viminalis*	Supple Jack				s					d	
Rubiaceae	*Everistia vacciniifolia var. vacciniifolia*	-										
Rubiaceae	*Pogonolobus reticulatus*											
Rubiaceae	*Psydrax attenuata*											
Rubiaceae	*Spermacoce brachystema*											
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood				a,s						
Rutaceae	*Geijera salicifolia*	Scrub Wilga				a						
Rutaceae	*Phebalium glandulosum*	Desert Phebalium										
Santalaceae	*Santalum lanceolatum*	Northern Sandlewood	a									
Sapindaceae	*Atalaya hemiglauca*	Whitewood										
Sapindaceae	*Atalaya sp.*	-										
Sapindaceae	*Distichostemon dodecandra*	a Hopbush										
Sapindaceae	*Dodonaea filifolia*	a Hopbush										
Sapindaceae	*Dodonaea lanceolata*	a Hopbush										
Scrophulariaceae	*Eremophila mitchellii*	False Sandalwood				d						
Scrophulariaceae	*Scoparia dulcis*	Goatweed										
Solanaceae	*Solanum ferocissimum*	Spiny Potato Bush										
Solanaceae	*Solanum parviflorum*	-										
Solanaceae	*Solanum sp.*	-										
Sparrmanniaceae	*Grewia retusifolia*	Dog's Balls							a		a	a
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia								a		
Stylidiaceae	*Stylidium eriorhizum*	-										
Violaceae	*Hybanthus enneaspermus*	Blue Spade Flower										
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	a Grass Tree										

Plant Species List and Quadrat Data - Quadrats 41 to 50												
Family	**Scientific Name**	**Common Name**	**Q41**	**Q42**	**Q43**	**Q44**	**Q45**	**Q46**	**Q47**	**Q48**	**Q49**	**Q50**
Acanthaceae	*Brunoniella australis*	Blue Trumpet										a
Acanthaceae	*Pseuderanthemum variabile*											
Acanthaceae	*Rostellularia adscendens*	-										a
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern										
Adiantaceae	*Cheilanthes sieberi*	-					a					
Amaranthaceae	*Achyranthes aspera*	Chaff Flower										
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed							a			
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed						a				
Anthericaceae	*Tricoryne anceps*	-										
Apiaceae	*Eryngium plantagineum*	Long Eryngium										
Apiaceae	*Platysace valida*											
Apocynaceae	*Alstonia constricta*				a							
Apocynaceae	*Carissa lanceolata*	Currant Bush										
Apocynaceae	*Carissa ovata*	Currant Bush										
Apocynaceae	*Marsdenia microlepis*	-										
Apocynaceae	*Parsonsia eucalyptophylla*	Gargaloo										
Apocynaceae	*Parsonsia lanceolata*											
Asteraceae	*Calotis sp.*	a Burr-daisy										
Asteraceae	*Camptacra barbata*	-										
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting										
Asteraceae	*Coronidium glutinosum*											
Asteraceae	*Cyanthillium cinereum*											
Asteraceae	*Emilia sonchifolia*	Lilac Tasselflower						a				
Asteraceae	*Epaltes australis**	-										
Asteraceae	*Parthenium hysterophorus*									**s**		

Asteraceae	*Peripleura bicolor*											
Asteraceae	*Peripleura virgata*	-										
Asteraceae	*Pterocaulon redolens*	Rag Weed, Pintye-Pintye										
Asteraceae	*Pterocaulon serrulatum*			a		a	a			a		
Asteraceae	*Rutidosis leucantha*											
Asteraceae	*Senecio brigalowensis*					a						
Asteraceae	*Vittadinia pustulata*	a Fuzzweed										
Asteraceae	*Wedelia spilanthoides*											
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine										
Boraginaceae	*Heliotropium sp.*											
Byttneriaceae	*Keraudrenia collina*	-										
Byttneriaceae	*Waltheria indica*											
Caesalpiniaceae	*Chamaecrista absus*											
Caesalpiniaceae	*Chamaecrista concinna*	-										
Caesalpiniaceae	*Chamaecrista mimosoides*											
Caesalpiniaceae	*Chamaecrista nomame*											
Caesalpiniaceae	*Lysiphyllum carronii*											
Caesalpiniaceae	*Senna costata*	-										
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell										
Campanulaceae	*Wahlenbergia gracilis*	a Bluebell				a		a				
Campanulaceae	*Wahlenbergia sp.*					a						
Capparaceae	*Capparis canescens*	-										
Capparaceae	*Capparis lasiantha*	Nepine										
Caryophyllaceae	*Polycarpaea corymbosa*											
Celastraceae	*Maytenus cunninghamii*	Western Rosewood								a		
Chenopodiaceae	*Einadia nutans*	climbing saltbush										

Clusiaceae	*Hypericum gramineum*	Small St John's Wort				a						
Combretaceae	*Terminalia oblongata*	Yellow-wood										
Convolvulaceae	*Evolvulus alsinoides*											
Convolvulaceae	*Ipomoea sp.*											
Cyperaceae	*Abildgaardia ovata*						a					
Cyperaceae	*Bulbostylis barbata*	Watergrass										
Cyperaceae	*Cyperus conicus*	-										
Cyperaceae	*Cyperus difformis*	Dirty Dora										
Cyperaceae	*Cyperus flaccidus*	Lax Flat-sedge										
Cyperaceae	*Cyperus fulvus*	Sticky Sedge										
Cyperaceae	*Cyperus gracilis*										a	
Cyperaceae	*Cyperus holoschoenus*											
Cyperaceae	*Cyperus lucidus*	Leafy Flat Sedge										
Cyperaceae	*Eleocharis plana*	Flat Spike-sedge										
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge										
Cyperaceae	*Gahnia aspera*	Saw Sedge										
Cyperaceae	*Schoenoplectus dissachanthus*	Blunt Club-sedge										
Cyperaceae	*Schoenoplectus lateriflorus*	-										
Cyperaceae	*Schoenus kennyi*	-										
Cyperaceae	*Scleria mackaviensis*											
Cyperaceae	*Scleria sphacelata*				d							
Cyperaceaee	*Cyperus perangustus*	Umbrella Sedge										
Droseraceae	*Drosera burmanni*	a Sundew										
Droseraceae	*Drosera indica*	Flycatcher										
Euphorbiaceae	*Beyeria viscosa*	a Wallaby Bush		d								
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed						a				
Euphorbiaceae	*Euphorbia mitchelliana*	a Spurge										c

Fabaceae	*Aeschynomene indica*											
Fabaceae	*Cajanus marmoratus*	-										
Fabaceae	*Crotalaria medicaginea*											
Fabaceae	*Crotalaria mitchellii subsp. mitchellii*	Yellow Rattlepod										
Fabaceae	*Crotalaria montana*	a Rattlepod										
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil				a						
Fabaceae	*Desmodium varians*	Slender Tick-trefoil										
Fabaceae	*Erythrina verspetilio*	Native Coral Tree										
Fabaceae	*Galactia tenuiflora*	a Lovecreeper										
Fabaceae	*Gastrolobium grandiflorum*	Heart-leaf Poison Bush										
Fabaceae	*Glycine clandestina*	a Lovecreeper										
Fabaceae	*Glycine sp. (Mackay SBAndrews+43)*									a		a
Fabaceae	*Glycine tomentella*	a Lovecreeper				a						c
Fabaceae	*Hovea parvicalyx*	-	c			a	d					
Fabaceae	*Indigo linifolia*	Narrow-leaf Indigo										
Fabaceae	*Indigofera colutea*											
Fabaceae	*Indigofera haplophylla*											
Fabaceae	*Indigofera hirsuta*	Hairy Indigo										
Fabaceae	*Indigofera linifolia*	-										
Fabaceae	*Indigofera linnaei*	Birdsville Indigo										a
Fabaceae	*Indigofera pratensis*					a						
Fabaceae	*Indigofera sp. (Aramac E.J.Thompson+ JER177*	-										
Fabaceae	*Jacksonia ramosissima*	a Dogwood										
Fabaceae	*Jacksonia rhadinoclada*											
Fabaceae	*Labichea rupestris*	-										
Fabaceae	*Mirbelia aotoides*											

Fabaceae	*Mirbelia viminalis*											
Fabaceae	*Rhynchosia minima*											
Fabaceae	*Stylosanthes scabra**	a Rattlepod										
Fabaceae	*Tephrosia brachyodon*	-										
Fabaceae	*Tephrosia juncea*	-				a						a
Fabaceae	*Tephrosia leptoclada*											
Fabaceae	*Uraria lagopodioides*	Prickitch										
Fabaceae	*Vigna lanceolata*	Maloga Bean										
Fabaceae	*Zornia areolata*											
Fabaceae	*Zornia dyctiocarpa var. Filifolia*											
Gentiaceae	*Schenkia australis*	-										
Goodeniaceae	*Goodenia armitiana*											
Goodeniaceae	*Goodenia gracilis*	Slender Goodenia										
Goodeniaceae	*Goodenia grandiflora*	-										
Goodeniaceae	*Goodenia hederacea*											
Goodeniaceae	*Goodenia sp.*	-						**a**				
Goodeniaceae	*Goodenia splendida*	-										
Haloragaceae	*Gonocarpus sp.*											
Juncaceae	*Juncus continuus*	-							a		d	
Lamiaceae	*Prostanthera parviflora*	-										
Lauraceae	*Cassytha filiformis*											
Lauraceae	*Cassytha glabella*											
Lobeliaceae	*Pratia purpurascens*	Whiteroot				a		a				
Lomandraceae	*Lomandra leucocephala*	Woolly Mat-rush										
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush				a				a	a	
Lomandraceae	*Lomandra multiflora*	Many Flowered Matrush										
Loranthaceae	*Amyema quandang*											

Lythraceae	*Rotala mexicana*	-										
Malvaceae	*Hibiscus meraukensis*											
Malvaceae	*Sida cordifolia*							a	d	a	a	
Malvaceae	*Sida cunninghamiana*	Ridged Sida		d		a		d	a	a		a
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne							a		a	
Malvaceae	*Sida spinosa**	Arrow-leaf Sida										
Marsileaceae	*Marsilea hirsuta*	Hansen's Nardoo										
Mimosaceae	*Acacia cowleana*	Halls Creek Wattle					a,d					a
Mimosaceae	*Acacia dietrichiana*											
Mimosaceae	*Acacia elachantha*	-										
Mimosaceae	*Acacia excelsa*	-										
Mimosaceae	*Acacia farnesiana*											
Mimosaceae	*Acacia galioides*	-										
Mimosaceae	*Acacia gnidium*	-										
Mimosaceae	*Acacia holosericea*	Soapbush Wattle										
Mimosaceae	*Acacia hyaloneura*	-										
Mimosaceae	*Acacia laccata*	-										
Mimosaceae	*Acacia leptostachya*	Townsville Wattle										
Mimosaceae	*Acacia longispicata*			a								
Mimosaceae	*Acacia melleodora*											
Mimosaceae	*Acacia multisiliqua*											
Mimosaceae	*Acacia platycarpa*	-										
Mimosaceae	*Acacia ramiflora*	-		a		d						
Mimosaceae	*Acacia sericophylla*	-										
Mimosaceae	*Acacia shirleyi*		d		d		a,d					
Mimosaceae	*Acacia sp.*	-										
Mimosaceae	*Acacia stipuligera*	-										a

Mimosaceae	*Acacia tenuissima*	Narrow-leaved Wattle										
Mimosaceae	*Acacia tropica*	-				a						
Mimosaceae	*Archidendropsis basaltica*											
Moraceae	*Ficus rubiginosa forma glabrescens*	a Fig										
Myoporaceae	*Eremophila longifolia*											
Myoporaceae	*Eremophila sp.*	an Emubush										
Myoporaceae	*Myoporum acuminatum*	Waterbush										
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush										
Myrtaceae	*Calytrix microcoma*	Turkey Bush										
Myrtaceae	*Corymbia brachycarpa*	a Bloodwood								a,c,d	a	
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum							a	c,d		
Myrtaceae	*Corymbia leichhardtii*	Yellowjacket	a	a	d	a	a					
Myrtaceae	*Corymbia plena*	a Bloodwood			a		d					
Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood										
Myrtaceae	*Eucalyptus brownii*	Reid River Box		d				c				
Myrtaceae	*Eucalyptus camaldulensis*								d		d	
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark										
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark		a		d	a					
Myrtaceae	*Eucalyptus exilipes*	Fine-leaved Ironbark	c		d							
Myrtaceae	*Eucalyptus fibrosa*	Broad-leaved Ironbark										
Myrtaceae	*Eucalyptus lamprophylla*	Shiny-leaved Bloodwood										
Myrtaceae	*Eucalyptus mediocris*											
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark						c	a			
Myrtaceae	*Eucalyptus persistens*	-										
Myrtaceae	*Eucalyptus similis*	Inland Yellow Jacket										d

Myrtaceae	*Eucalyptus spp. mixed specimen*	a mallee eucalypt										
Myrtaceae	*Eucalyptus teretecornis*	Forest Red Gum										
Myrtaceae	*Homoranthus thomasii*											
Myrtaceae	*Lithomyrtus microphylla*		c									
Myrtaceae	*Melaleuca bracteata*	Black Tea-tree										
Myrtaceae	*Melaleuca chisholmii*	A paper bark										
Myrtaceae	*Melaleuca minutifolia*	-										
Myrtaceae	*Melaleuca nervosa*	a Paperbark										
Myrtaceae	*Melaleuca pallescens*	a Paperbark										
Myrtaceae	*Melaleuca sp.*	a Paperbark										
Myrtaceae	*Melaleuca tamariscina*	a Paperbark										
Myrtaceae	*Thryptomene parviflora*											
Nyctaginaceae	*Boerhavia sp.*											
Oleaceae	*Jasminum didymum*									a		
Oleaceae	*Jasminum lineare*	-										
Onagraceae	*Ludwigia octovalvis*	Native Willow Primrose										
Pentapetaceae	*Melhania ovata*											
Phormiaceae	*Dianella longifolia*	Blueberry Lily				a						
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush				a						
Phyllanthaceae	*Phyllanthus collinus*											
Phyllanthaceae	*Phyllanthus fuernrohrii*		a									
Phyllanthaceae	*Phyllanthus maderaspatensis*											
Phyllanthaceae	*Phyllanthus sp.*	-										
Phyllanthaceae	*Phyllanthus virgatus*	-										
Phyllanthaceae	*Sauropus elachophyllus*		a	d			a	a				
Picrodendraceae	*Petalostigma banksii*	Smooth-leaved Quinine				a	a					
Picrodendraceae	*Petalostigma pubescens*	Quinine Bush						a				a

Pittosporaceae	*Bursaria incana*	Mock Orange, Prickly Pine										a
Poaceae	*Allopteropsis semialata*	Cockatoo Grass										
Poaceae	*Ancistrachne uncinulata*	Hooky Grass										
Poaceae	*Aristida caput-medusae*											
Poaceae	*Aristida holathera*											**c**
Poaceae	*Aristida ingrata*	a Threeawn Grass										
Poaceae	*Aristida pruinosa*	a Threeawn Grass				a		c		a		a
Poaceae	*Aristida sp.*		a		a		s					
Poaceae	*Arundinella nepalensis*	-		a								
Poaceae	*Bothriochloa bladhii var. bladhii*	Forest Bluegrass										
Poaceae	*Bothriochloa decipiens var. cloncurrensis*	Pitted Bluegrass										
Poaceae	*Bothriochloa ewartiana*	Desert Bluegrass								c	d	
Poaceae	*Bothriochloa sp.*							c		a		
Poaceae	*Capillipedium parviflorum*	Scented-top Grass										
Poaceae	*Cenchrus ciliaris**	Buffel Grass				a		a	a			
Poaceae	*Cleistochloa subjuncea*	-	c	a	d		d					
Poaceae	*Cymbopogon bombycinus*	a Lemongrass					a				a	
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass						a				
Poaceae	*Cynodon dactylon**	Couch Grass										
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass										
Poaceae	*Digitaria ammophila*	Silky Umbrella-grass										
Poaceae	*Digitaria breviglumis*											
Poaceae	*Digitaria ciliaris**	a Cockatoo Grass										
Poaceae	*Digitaria diminuta*	-										
Poaceae	*Digitaria gibbosa*											

Poaceae	*Echinochloa colona*	Awnless Barnyard Grass										
Poaceae	*Enneapogon lindleyanus*											
Poaceae	*Enneapogon polyphyllus*	-										
Poaceae	*Enneapogon robustissimus*	a Hedgehog Grass										
Poaceae	*Enneapogon sp.*											
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass										
Poaceae	*Eragrostis brownii*	Brown's Lovegrass					s	a				
Poaceae	*Eragrostis elongata*	Clustered Lovegrass							a			
Poaceae	*Eragrostis leptocarpa*								a			
Poaceae	*Eragrostis sororia*	a Lovegrass										
Poaceae	*Eragrostis sp.*											
Poaceae	*Eragrostis spartinoides*	a Lovegrass					a		c		a	
Poaceae	*Eragrostis speciosa*								c			
Poaceae	*Eriachne obtusa*	Northern Wandarrie Grass										
Poaceae	*Eulalia aurea*	-										
Poaceae	*Eulalia fulva*	Silky Browntop										
Poaceae	*Heteropogon contortus*	Black Speargrass				a		c	a	c		a
Poaceae	*Imperata cylindrica*	Bladey Grass									d	
Poaceae	*Leptochloa decipiens*											
Poaceae	*Leptochloa fusca subsp. fusca*	Brown Beetle Grass										
Poaceae	*Melinis repens**	Red Natal Grass								a		
Poaceae	*Panicum effusum*	Hairy Panic										a
Poaceae	*Panicum larcomianum*	-										
Poaceae	*Panicum simile*											
Poaceae	*Panicum sp.*		a			a						

Poaceae	*Paspalidium caespitosum*	Brigalow Grass										
Poaceae	*Paspalidium distans*	-										
Poaceae	*Paspalum scrobiculatum*										d	
Poaceae	*Perotis rara*	Comet Grass										
Poaceae	*Sarga timorense*	-										
Poaceae	*Schizachyrium fragile*	Fire Grass										
Poaceae	*Sehima nervosum*	Rat's-tail Grass						a				
Poaceae	*Setaria surgens*	-										
Poaceae	*Sporobolus caroli*	Yakka Grass		a				a				
Poaceae	*Themeda avenacea*	Oat Kangaroo Grass				c						
Poaceae	*Themeda triandra*	Kangaroo Grass				c			a			c
Poaceae	*Triodia longiceps*	Giant Grey Spinifex										
Poaceae	*Triodia molesta*											
Poaceae	*Triodia pungens*	-					s					
Poaceae	*Urochloa piligera*	Hairy Armgrass										
Polygalaceae	*Comesperma sp.*	-										
Polygonaceae	*Comesperma pallidum*	-	a	a			a					a
Polygonaceae	*Persicaria sp. (insufficient material)*	a Knotweed							a			
Proteaceae	*Grevillea decora*		c	a								
Proteaceae	*Grevillea glauca*	Bushman's Clothes Pegs										
Proteaceae	*Grevillea parallela*											
Proteaceae	*Grevillea pteridifolia*	Darwin Silky Oak										
Proteaceae	*Grevillea sessilis*	Silky Oak										
Proteaceae	*Hakea lorea*	Bootlace Oak										
Proteaceae	*Persoonia falcata*											
Proteaceae	*Persoonia sp.*	a Geebung	a		a							

Rhamnaceae	*Alphitonia excelsa*	Red Ash										
Rhamnaceae	*Ventilago viminalis*	Supple Jack										
Rubiaceae	*Everistia vacciniifolia var. vacciniifolia*	-										
Rubiaceae	*Pogonolobus reticulatus*											
Rubiaceae	*Psydrax attenuata*											
Rubiaceae	*Spermacoce brachystema*											
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood										
Rutaceae	*Geijera salicifolia*	Scrub Wilga										
Rutaceae	*Phebalium glandulosum*	Desert Phebalium										
Santalaceae	*Santalum lanceolatum*	Northern Sandlewood					a					
Sapindaceae	*Atalaya hemiglauca*	Whitewood										
Sapindaceae	*Atalaya sp.*	-										
Sapindaceae	*Distichostemon dodecandra*	a Hopbush		a		a	a					
Sapindaceae	*Dodonaea filifolia*	a Hopbush	c									
Sapindaceae	*Dodonaea lanceolata*	a Hopbush	a	a		a						
Scrophulariaceae	*Eremophila mitchellii*	False Sandalwood										
Scrophulariaceae	*Scoparia dulcis*	Goatweed										
Solanaceae	*Solanum ferocissimum*	Spiny Potato Bush										
Solanaceae	*Solanum parviflorum*	-										
Solanaceae	*Solanum sp.*	-										
Sparrmanniaceae	*Grewia retusifolia*	Dog's Balls				a		a		a	a	
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia										
Stylidiaceae	*Stylidium eriorhizum*	-										
Violaceae	*Hybanthus enneaspermus*	Blue Spade Flower										
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	a Grass Tree										

Plant Species List and Quadrat Data - Quadrats 51 to 60												
Family	**Scientific Name**	**Common Name**	**Q51**	**Q52**	**Q53**	**Q54**	**Q55**	**Q56**	**Q57**	**Q58**	**Q59**	**Q60**
Acanthaceae	*Brunoniella australis*	Blue Trumpet										
Acanthaceae	*Pseuderanthemum variabile*											
Acanthaceae	*Rostellularia adscendens*	-										
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern		a								
Adiantaceae	*Cheilanthes sieberi*	-										
Amaranthaceae	*Achyranthes aspera*	Chaff Flower		a		a						
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed										
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed										
Anthericaceae	*Tricoryne anceps*	-										
Apiaceae	*Eryngium plantagineum*	Long Eryngium										
Apiaceae	*Platysace valida*				a							
Apocynaceae	*Alstonia constricta*					a						
Apocynaceae	*Carissa lanceolata*	Currant Bush										
Apocynaceae	*Carissa ovata*	Currant Bush		d		d						
Apocynaceae	*Marsdenia microlepis*	-										
Apocynaceae	*Parsonsia eucalyptophylla*	Gargaloo										
Apocynaceae	*Parsonsia lanceolata*											
Asteraceae	*Calotis sp.*	a Burr-daisy										
Asteraceae	*Camptacra barbata*	-										
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting										
Asteraceae	*Coronidium glutinosum*											
Asteraceae	*Cyanthillium cinereum*		a									
Asteraceae	*Emilia sonchifolia*	Lilac Tasselflower										
Asteraceae	*Epaltes australis**	-										
Asteraceae	*Parthenium hysterophorus*											

Asteraceae	*Peripleura bicolor*											
Asteraceae	*Peripleura virgata*	-										
Asteraceae	*Pterocaulon redolens*	Rag Weed, Pintye-Pintye										
Asteraceae	*Pterocaulon serrulatum*											
Asteraceae	*Rutidosis leucantha*											
Asteraceae	*Senecio brigalowensis*											
Asteraceae	*Vittadinia pustulata*	a Fuzzweed										
Asteraceae	*Wedelia spilanthoides*											
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine										
Boraginaceae	*Heliotropium sp.*											
Byttneriaceae	*Keraudrenia collina*	-										
Byttneriaceae	*Waltheria indica*											
Caesalpiniaceae	*Chamaecrista absus*											
Caesalpiniaceae	*Chamaecrista concinna*	-										
Caesalpiniaceae	*Chamaecrista mimosoides*											
Caesalpiniaceae	*Chamaecrista nomame*											
Caesalpiniaceae	*Lysiphyllum carronii*											
Caesalpiniaceae	*Senna costata*	-										
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell	a									
Campanulaceae	*Wahlenbergia gracilis*	a Bluebell										
Campanulaceae	*Wahlenbergia sp.*											
Capparaceae	*Capparis canescens*	-										
Capparaceae	*Capparis lasiantha*	Nepine										
Caryophyllaceae	*Polycarpaea corymbosa*											
Celastraceae	*Maytenus cunninghamii*	Western Rosewood					a					
Chenopodiaceae	*Einadia nutans*	climbing saltbush										

Clusiaceae	*Hypericum gramineum*	Small St John's Wort										
Combretaceae	*Terminalia oblongata*	Yellow-wood										
Convolvulaceae	*Evolvulus alsinoides*											
Convolvulaceae	*Ipomoea sp.*											
Cyperaceae	*Abildgaardia ovata*											
Cyperaceae	*Bulbostylis barbata*	Watergrass										
Cyperaceae	*Cyperus conicus*	-										
Cyperaceae	*Cyperus difformis*	Dirty Dora										
Cyperaceae	*Cyperus flaccidus*	Lax Flat-sedge										
Cyperaceae	*Cyperus fulvus*	Sticky Sedge										
Cyperaceae	*Cyperus gracilis*			a								
Cyperaceae	*Cyperus holoschoenus*											
Cyperaceae	*Cyperus lucidus*	Leafy Flat Sedge										
Cyperaceae	*Eleocharis plana*	Flat Spike-sedge										
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge										
Cyperaceae	*Gahnia aspera*	Saw Sedge										
Cyperaceae	*Schoenoplectus dissachanthus*	Blunt Club-sedge										
Cyperaceae	*Schoenoplectus lateriflorus*	-										
Cyperaceae	*Schoenus kennyi*	-							a	a	a	a
Cyperaceae	*Scleria mackaviensis*		a									
Cyperaceae	*Scleria sphacelata*					a		a	a	a		a
Cyperaceaee	*Cyperus perangustus*	Umbrella Sedge				a						
Droseraceae	*Drosera burmanni*	a Sundew										
Droseraceae	*Drosera indica*	Flycatcher										
Euphorbiaceae	*Beyeria viscosa*	a Wallaby Bush				a						
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed										
Euphorbiaceae	*Euphorbia mitchelliana*	a Spurge										

Fabaceae	*Aeschynomene indica*											
Fabaceae	*Cajanus marmoratus*	-										
Fabaceae	*Crotalaria medicaginea*						a					
Fabaceae	*Crotalaria mitchellii subsp. mitchellii*	Yellow Rattlepod										
Fabaceae	*Crotalaria montana*	a Rattlepod										
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil	a									
Fabaceae	*Desmodium varians*	Slender Tick-trefoil	a									
Fabaceae	*Erythrina verspetilio*	Native Coral Tree										
Fabaceae	*Galactia tenuiflora*	a Lovecreeper					a					
Fabaceae	*Gastrolobium grandiflorum*	Heart-leaf Poison Bush						a,d	a			
Fabaceae	*Glycine clandestina*	a Lovecreeper										
Fabaceae	*Glycine sp. (Mackay SBAndrews+43)*		a				a					
Fabaceae	*Glycine tomentella*	a Lovecreeper	a									
Fabaceae	*Hovea parvicalyx*	-							a			
Fabaceae	*Indigo linifolia*	Narrow-leaf Indigo										
Fabaceae	*Indigofera colutea*											
Fabaceae	*Indigofera haplophylla*											
Fabaceae	*Indigofera hirsuta*	Hairy Indigo										
Fabaceae	*Indigofera linifolia*	-										
Fabaceae	*Indigofera linnaei*	Birdsville Indigo	a									
Fabaceae	*Indigofera pratensis*		a				a					
Fabaceae	*Indigofera sp. (Aramac E.J.Thompson+ JER177*	-										
Fabaceae	*Jacksonia ramosissima*	a Dogwood										
Fabaceae	*Jacksonia rhadinoclada*				a							
Fabaceae	*Labichea rupestris*	-				a		a			a	d
Fabaceae	*Mirbelia aotoides*				a							

Fabaceae	*Mirbelia viminalis*											
Fabaceae	*Rhynchosia minima*											
Fabaceae	*Stylosanthes scabra**	a Rattlepod										
Fabaceae	*Tephrosia brachyodon*	-										
Fabaceae	*Tephrosia juncea*	-										
Fabaceae	*Tephrosia leptoclada*											
Fabaceae	*Uraria lagopodioides*	Prickitch										
Fabaceae	*Vigna lanceolata*	Maloga Bean										
Fabaceae	*Zornia areolata*											
Fabaceae	*Zornia dyctiocarpa var. Filifolia*											
Gentiaceae	*Schenkia australis*	-										
Goodeniaceae	*Goodenia armitiana*											
Goodeniaceae	*Goodenia gracilis*	Slender Goodenia										
Goodeniaceae	*Goodenia grandiflora*	-	a									
Goodeniaceae	*Goodenia hederacea*											
Goodeniaceae	*Goodenia sp.*	-										
Goodeniaceae	*Goodenia splendida*	-										
Haloragaceae	*Gonocarpus sp.*		a									
Juncaceae	*Juncus continuus*	-				a						
Lamiaceae	*Prostanthera parviflora*	-							d			
Lauraceae	*Cassytha filiformis*						a					
Lauraceae	*Cassytha glabella*											
Lobeliaceae	*Pratia purpurascens*	Whiteroot										
Lomandraceae	*Lomandra leucocephala*	Woolly Mat-rush										
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush										
Lomandraceae	*Lomandra multiflora*	Many Flowered Matrush										
Loranthaceae	*Amyema quandang*											

Lythraceae	*Rotala mexicana*	-										
Malvaceae	*Hibiscus meraukensis*											
Malvaceae	*Sida cordifolia*		a									
Malvaceae	*Sida cunninghamiana*	Ridged Sida	a					a	a			
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne										
Malvaceae	*Sida spinosa**	Arrow-leaf Sida										
Marsileaceae	*Marsilea hirsuta*	Hansen's Nardoo										
Mimosaceae	*Acacia cowleana*	Halls Creek Wattle										
Mimosaceae	*Acacia dietrichiana*			d					a			
Mimosaceae	*Acacia elachantha*	-										
Mimosaceae	*Acacia excelsa*	-										
Mimosaceae	*Acacia farnesiana*											
Mimosaceae	*Acacia galioides*	-										
Mimosaceae	*Acacia gnidium*	-										
Mimosaceae	*Acacia holosericea*	Soapbush Wattle										
Mimosaceae	*Acacia hyaloneura*	-							a			
Mimosaceae	*Acacia laccata*	-										
Mimosaceae	*Acacia leptostachya*	Townsville Wattle			a						d	
Mimosaceae	*Acacia longispicata*											
Mimosaceae	*Acacia melleodora*						a					
Mimosaceae	*Acacia multisiliqua*											s
Mimosaceae	*Acacia platycarpa*	-										
Mimosaceae	*Acacia ramiflora*	-										
Mimosaceae	*Acacia sericophylla*	-					a					
Mimosaceae	*Acacia shirleyi*					c		a,d	a,c	a,d		a
Mimosaceae	*Acacia sp.*	-										
Mimosaceae	*Acacia stipuligera*	-										

Mimosaceae	*Acacia tenuissima*	Narrow-leaved Wattle										
Mimosaceae	*Acacia tropica*	-					a					
Mimosaceae	*Archidendropsis basaltica*		a	a								
Moraceae	*Ficus rubiginosa forma glabrescens*	a Fig										
Myoporaceae	*Eremophila longifolia*											
Myoporaceae	*Eremophila sp.*	an Emubush										
Myoporaceae	*Myoporum acuminatum*	Waterbush										
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush				a						
Myrtaceae	*Calytrix microcoma*	Turkey Bush									a	
Myrtaceae	*Corymbia brachycarpa*	a Bloodwood							c		d	c
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum					a					
Myrtaceae	*Corymbia leichhardtii*	Yellowjacket	a		d	a		a				c
Myrtaceae	*Corymbia plena*	a Bloodwood										
Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood					a					
Myrtaceae	*Eucalyptus brownii*	Reid River Box										
Myrtaceae	*Eucalyptus camaldulensis*											
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark	a,d									
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark				a,c	a	a		a		
Myrtaceae	*Eucalyptus exilipes*	Fine-leaved Ironbark										
Myrtaceae	*Eucalyptus fibrosa*	Broad-leaved Ironbark										
Myrtaceae	*Eucalyptus lamprophylla*	Shiny-leaved Bloodwood										
Myrtaceae	*Eucalyptus mediocris*											a
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark										
Myrtaceae	*Eucalyptus persistens*	-		a,d								
Myrtaceae	*Eucalyptus similis*	Inland Yellow Jacket					a,d					

Myrtaceae	*Eucalyptus spp. mixed specimen*	a mallee eucalypt										
Myrtaceae	*Eucalyptus teretecornis*	Forest Red Gum										
Myrtaceae	*Homoranthus thomasii*											
Myrtaceae	*Lithomyrtus microphylla*								a		c	
Myrtaceae	*Melaleuca bracteata*	Black Tea-tree				a						
Myrtaceae	*Melaleuca chisholmii*	A paper bark										
Myrtaceae	*Melaleuca minutifolia*	-										
Myrtaceae	*Melaleuca nervosa*	a Paperbark										
Myrtaceae	*Melaleuca pallescens*	a Paperbark										
Myrtaceae	*Melaleuca sp.*	a Paperbark										
Myrtaceae	*Melaleuca tamariscina*	a Paperbark										
Myrtaceae	*Thryptomene parviflora*				a							
Nyctaginaceae	*Boerhavia sp.*											
Oleaceae	*Jasminum didymum*		a	s		a						
Oleaceae	*Jasminum lineare*	-										
Onagraceae	*Ludwigia octovalvis*	Native Willow Primrose										
Pentapetaceae	*Melhania ovata*											
Phormiaceae	*Dianella longifolia*	Blueberry Lily										
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush	a	a								
Phyllanthaceae	*Phyllanthus collinus*											
Phyllanthaceae	*Phyllanthus fuernrohrii*											
Phyllanthaceae	*Phyllanthus maderaspatensis*											
Phyllanthaceae	*Phyllanthus sp.*	-						a	a			
Phyllanthaceae	*Phyllanthus virgatus*	-										
Phyllanthaceae	*Sauropus elachophyllus*											
Picrodendraceae	*Petalostigma banksii*	Smooth-leaved Quinine						a				a
Picrodendraceae	*Petalostigma pubescens*	Quinine Bush										

Pittosporaceae	*Bursaria incana*	Mock Orange, Prickly Pine					a					
Poaceae	*Allopteropsis semialata*	Cockatoo Grass										
Poaceae	*Ancistrachne uncinulata*	Hooky Grass										
Poaceae	*Aristida caput-medusae*					a						
Poaceae	*Aristida holathera*											
Poaceae	*Aristida ingrata*	a Threeawn Grass					a					
Poaceae	*Aristida pruinosa*	a Threeawn Grass	a		a	a						
Poaceae	*Aristida sp.*			d		a						
Poaceae	*Arundinella nepalensis*	-										
Poaceae	*Bothriochloa bladhii var. bladhii*	Forest Bluegrass										
Poaceae	*Bothriochloa decipiens var. cloncurrensis*	Pitted Bluegrass	d									
Poaceae	*Bothriochloa ewartiana*	Desert Bluegrass										
Poaceae	*Bothriochloa sp.*											
Poaceae	*Capillipedium parviflorum*	Scented-top Grass										
Poaceae	*Cenchrus ciliaris**	Buffel Grass										
Poaceae	*Cleistochloa subjuncea*	-		a				c	c	a	a	s
Poaceae	*Cymbopogon bombycinus*	a Lemongrass				a	a					
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	a	a								
Poaceae	*Cynodon dactylon**	Couch Grass										
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass										
Poaceae	*Digitaria ammophila*	Silky Umbrella-grass										
Poaceae	*Digitaria breviglumis*											
Poaceae	*Digitaria ciliaris**	a Cockatoo Grass										
Poaceae	*Digitaria diminuta*	-										
Poaceae	*Digitaria gibbosa*											

Poaceae	*Echinochloa colona*	Awnless Barnyard Grass										
Poaceae	*Enneapogon lindleyanus*											
Poaceae	*Enneapogon polyphyllus*	-										
Poaceae	*Enneapogon robustissimus*	a Hedgehog Grass										
Poaceae	*Enneapogon sp.*			a		a						
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass										
Poaceae	*Eragrostis brownii*	Brown's Lovegrass										
Poaceae	*Eragrostis elongata*	Clustered Lovegrass										
Poaceae	*Eragrostis leptocarpa*											
Poaceae	*Eragrostis sororia*	a Lovegrass										
Poaceae	*Eragrostis sp.*											
Poaceae	*Eragrostis spartinoides*	a Lovegrass	a									
Poaceae	*Eragrostis speciosa*											
Poaceae	*Eriachne obtusa*	Northern Wandarrie Grass										
Poaceae	*Eulalia aurea*	-										
Poaceae	*Eulalia fulva*	Silky Browntop										
Poaceae	*Heteropogon contortus*	Black Speargrass	s			d	s					
Poaceae	*Imperata cylindrica*	Bladey Grass										
Poaceae	*Leptochloa decipiens*			a								
Poaceae	*Leptochloa fusca subsp. fusca*	Brown Beetle Grass										
Poaceae	*Melinis repens**	Red Natal Grass		a								
Poaceae	*Panicum effusum*	Hairy Panic					a					
Poaceae	*Panicum larcomianum*	-	a									
Poaceae	*Panicum simile*								a			
Poaceae	*Panicum sp.*											

Poaceae	*Paspalidium caespitosum*	Brigalow Grass										
Poaceae	*Paspalidium distans*	-										
Poaceae	*Paspalum scrobiculatum*											
Poaceae	*Perotis rara*	Comet Grass										
Poaceae	*Sarga timorense*	-										
Poaceae	*Schizachyrium fragile*	Fire Grass										
Poaceae	*Sehima nervosum*	Rat's-tail Grass										
Poaceae	*Setaria surgens*	-										
Poaceae	*Sporobolus caroli*	Yakka Grass										
Poaceae	*Themeda avenacea*	Oat Kangaroo Grass										
Poaceae	*Themeda triandra*	Kangaroo Grass	s	a			d					
Poaceae	*Triodia longiceps*	Giant Grey Spinifex										
Poaceae	*Triodia molesta*											
Poaceae	*Triodia pungens*	-			d	d	a	c	c	d	d	d
Poaceae	*Urochloa piligera*	Hairy Armgrass										
Polygalaceae	*Comesperma sp.*	-										
Polygonaceae	*Comesperma pallidum*	-			s					a		
Polygonaceae	*Persicaria sp. (insufficient material)*	a Knotweed										
Proteaceae	*Grevillea decora*								a			
Proteaceae	*Grevillea glauca*	Bushman's Clothes Pegs										
Proteaceae	*Grevillea parallela*											
Proteaceae	*Grevillea pteridifolia*	Darwin Silky Oak										
Proteaceae	*Grevillea sessilis*	Silky Oak			d,s	a		a		d	a	
Proteaceae	*Hakea lorea*	Bootlace Oak										
Proteaceae	*Persoonia falcata*								a	a	a	a
Proteaceae	*Persoonia sp.*	a Geebung										

Rhamnaceae	*Alphitonia excelsa*	Red Ash	a			d						
Rhamnaceae	*Ventilago viminalis*	Supple Jack										
Rubiaceae	*Everistia vacciniifolia var. vacciniifolia*	-										
Rubiaceae	*Pogonolobus reticulatus*					a						
Rubiaceae	*Psydrax attenuata*			a								
Rubiaceae	*Spermacoce brachystema*											
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood										
Rutaceae	*Geijera salicifolia*	Scrub Wilga	a	a								
Rutaceae	*Phebalium glandulosum*	Desert Phebalium										
Santalaceae	*Santalum lanceolatum*	Northern Sandlewood										
Sapindaceae	*Atalaya hemiglauca*	Whitewood		a		a						
Sapindaceae	*Atalaya sp.*	-										
Sapindaceae	*Distichostemon dodecandra*	a Hopbush			a							
Sapindaceae	*Dodonaea filifolia*	a Hopbush							a			
Sapindaceae	*Dodonaea lanceolata*	a Hopbush										
Scrophulariaceae	*Eremophila mitchellii*	False Sandalwood		a								
Scrophulariaceae	*Scoparia dulcis*	Goatweed										
Solanaceae	*Solanum ferocissimum*	Spiny Potato Bush		a								
Solanaceae	*Solanum parviflorum*	-										
Solanaceae	*Solanum sp.*	-										
Sparrmanniaceae	*Grewia retusifolia*	Dog's Balls	a									
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia					a					
Stylidiaceae	*Stylidium eriorhizum*	-										
Violaceae	*Hybanthus enneaspermus*	Blue Spade Flower										
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	a Grass Tree										

Plant Species List and Quadrat Data - Quadrats 61 to 70												
Family	**Scientific Name**	**Common Name**	**Q61**	**Q62**	**Q63**	**Q64**	**Q65**	**Q66**	**Q67**	**Q68**	**Q69**	**Q70**
Acanthaceae	*Brunoniella australis*	Blue Trumpet						a				
Acanthaceae	*Pseuderanthemum variabile*											
Acanthaceae	*Rostellularia adscendens*	-										
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern										
Adiantaceae	*Cheilanthes sieberi*	-										
Amaranthaceae	*Achyranthes aspera*	Chaff Flower										
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed										
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed										
Anthericaceae	*Tricoryne anceps*	-										
Apiaceae	*Eryngium plantagineum*	Long Eryngium										
Apiaceae	*Platysace valida*											
Apocynaceae	*Alstonia constricta*											
Apocynaceae	*Carissa lanceolata*	Currant Bush										
Apocynaceae	*Carissa ovata*	Currant Bush						d	d	d	d	a
Apocynaceae	*Marsdenia microlepis*	-										
Apocynaceae	*Parsonsia eucalyptophylla*	Gargaloo										
Apocynaceae	*Parsonsia lanceolata*											
Asteraceae	*Calotis sp.*	a Burr-daisy										
Asteraceae	*Camptacra barbata*	-										
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting										
Asteraceae	*Coronidium glutinosum*											
Asteraceae	*Cyanthillium cinereum*											
Asteraceae	*Emilia sonchifolia*	Lilac Tasselflower										
Asteraceae	*Epaltes australis**	-										
Asteraceae	*Parthenium hysterophorus*											

Asteraceae	*Peripleura bicolor*				a							
Asteraceae	*Peripleura virgata*	-										
Asteraceae	*Pterocaulon redolens*	Rag Weed, Pintye-Pintye										
Asteraceae	*Pterocaulon serrulatum*		a									
Asteraceae	*Rutidosis leucantha*											
Asteraceae	*Senecio brigalowensis*											
Asteraceae	*Vittadinia pustulata*	a Fuzzweed										
Asteraceae	*Wedelia spilanthoides*											
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine										
Boraginaceae	*Heliotropium sp.*											
Byttneriaceae	*Keraudrenia collina*	-										
Byttneriaceae	*Waltheria indica*											
Caesalpiniaceae	*Chamaecrista absus*											
Caesalpiniaceae	*Chamaecrista concinna*	-										
Caesalpiniaceae	*Chamaecrista mimosoides*											
Caesalpiniaceae	*Chamaecrista nomame*											
Caesalpiniaceae	*Lysiphyllum carronii*											
Caesalpiniaceae	*Senna costata*	-										
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell										
Campanulaceae	*Wahlenbergia gracilis*	a Bluebell										
Campanulaceae	*Wahlenbergia sp.*											
Capparaceae	*Capparis canescens*	-										
Capparaceae	*Capparis lasiantha*	Nepine										
Caryophyllaceae	*Polycarpaea corymbosa*											
Celastraceae	*Maytenus cunninghamii*	Western Rosewood			a			a				a
Chenopodiaceae	*Einadia nutans*	climbing saltbush										

Clusiaceae	*Hypericum gramineum*	Small St John's Wort										
Combretaceae	*Terminalia oblongata*	Yellow-wood										
Convolvulaceae	*Evolvulus alsinoides*											
Convolvulaceae	*Ipomoea sp.*											
Cyperaceae	*Abildgaardia ovata*		a	a								
Cyperaceae	*Bulbostylis barbata*	Watergrass										
Cyperaceae	*Cyperus conicus*	-										
Cyperaceae	*Cyperus difformis*	Dirty Dora										
Cyperaceae	*Cyperus flaccidus*	Lax Flat-sedge										
Cyperaceae	*Cyperus fulvus*	Sticky Sedge										
Cyperaceae	*Cyperus gracilis*											
Cyperaceae	*Cyperus holoschoenus*											
Cyperaceae	*Cyperus lucidus*	Leafy Flat Sedge										
Cyperaceae	*Eleocharis plana*	Flat Spike-sedge										
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge										
Cyperaceae	*Gahnia aspera*	Saw Sedge										
Cyperaceae	*Schoenoplectus dissachanthus*	Blunt Club-sedge										
Cyperaceae	*Schoenoplectus lateriflorus*	-										
Cyperaceae	*Schoenus kennyi*	-		a								
Cyperaceae	*Scleria mackaviensis*											
Cyperaceae	*Scleria sphacelata*			a								
Cyperaceaee	*Cyperus perangustus*	Umbrella Sedge										
Droseraceae	*Drosera burmanni*	a Sundew										
Droseraceae	*Drosera indica*	Flycatcher										
Euphorbiaceae	*Beyeria viscosa*	a Wallaby Bush		d								
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed										
Euphorbiaceae	*Euphorbia mitchelliana*	a Spurge										

Fabaceae	*Aeschynomene indica*											
Fabaceae	*Cajanus marmoratus*	-										
Fabaceae	*Crotalaria medicaginea*				a							
Fabaceae	*Crotalaria mitchellii subsp. mitchellii*	Yellow Rattlepod										
Fabaceae	*Crotalaria montana*	a Rattlepod										
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil										
Fabaceae	*Desmodium varians*	Slender Tick-trefoil										
Fabaceae	*Erythrina verspetilio*	Native Coral Tree										
Fabaceae	*Galactia tenuiflora*	a Lovecreeper										
Fabaceae	*Gastrolobium grandiflorum*	Heart-leaf Poison Bush		a								
Fabaceae	*Glycine clandestina*	a Lovecreeper										
Fabaceae	*Glycine sp. (Mackay SBAndrews+43)*				a			a				
Fabaceae	*Glycine tomentella*	a Lovecreeper										
Fabaceae	*Hovea parvicalyx*	-		a								
Fabaceae	*Indigo linifolia*	Narrow-leaf Indigo										
Fabaceae	*Indigofera colutea*											
Fabaceae	*Indigofera haplophylla*											
Fabaceae	*Indigofera hirsuta*	Hairy Indigo										
Fabaceae	*Indigofera linifolia*	-										
Fabaceae	*Indigofera linnaei*	Birdsville Indigo										
Fabaceae	*Indigofera pratensis*											
Fabaceae	*Indigofera sp. (Aramac E.J.Thompson+ JER177*	-										
Fabaceae	*Jacksonia ramosissima*	a Dogwood	d	d								
Fabaceae	*Jacksonia rhadinoclada*											
Fabaceae	*Labichea rupestris*	-		a								
Fabaceae	*Mirbelia aotoides*											

Fabaceae	*Mirbelia viminalis*											
Fabaceae	*Rhynchosia minima*				a							
Fabaceae	*Stylosanthes scabra**	a Rattlepod										
Fabaceae	*Tephrosia brachyodon*	-										
Fabaceae	*Tephrosia juncea*	-										
Fabaceae	*Tephrosia leptoclada*											
Fabaceae	*Uraria lagopodioides*	Prickitch										
Fabaceae	*Vigna lanceolata*	Maloga Bean										
Fabaceae	*Zornia areolata*											
Fabaceae	*Zornia dyctiocarpa var. Filifolia*											
Gentiaceae	*Schenkia australis*	-										
Goodeniaceae	*Goodenia armitiana*											
Goodeniaceae	*Goodenia gracilis*	Slender Goodenia										
Goodeniaceae	*Goodenia grandiflora*	-										
Goodeniaceae	*Goodenia hederacea*		a									
Goodeniaceae	*Goodenia sp.*	-										
Goodeniaceae	*Goodenia splendida*	-										
Haloragaceae	*Gonocarpus sp.*											
Juncaceae	*Juncus continuus*	-										
Lamiaceae	*Prostanthera parviflora*	-										
Lauraceae	*Cassytha filiformis*											
Lauraceae	*Cassytha glabella*			a								
Lobeliaceae	*Pratia purpurascens*	Whiteroot										
Lomandraceae	*Lomandra leucocephala*	Woolly Mat-rush										
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush										
Lomandraceae	*Lomandra multiflora*	Many Flowered Matrush						a				
Loranthaceae	*Amyema quandang*											

Lythraceae	*Rotala mexicana*	-										
Malvaceae	*Hibiscus meraukensis*											
Malvaceae	*Sida cordifolia*											
Malvaceae	*Sida cunninghamiana*	Ridged Sida									a	
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne										
Malvaceae	*Sida spinosa**	Arrow-leaf Sida										
Marsileaceae	*Marsilea hirsuta*	Hansen's Nardoo										
Mimosaceae	*Acacia cowleana*	Halls Creek Wattle					a					d
Mimosaceae	*Acacia dietrichiana*			a								
Mimosaceae	*Acacia elachantha*	-										
Mimosaceae	*Acacia excelsa*	-										
Mimosaceae	*Acacia farnesiana*											
Mimosaceae	*Acacia galioides*	-										
Mimosaceae	*Acacia gnidium*	-										
Mimosaceae	*Acacia holosericea*	Soapbush Wattle							a			
Mimosaceae	*Acacia hyaloneura*	-	a	a	a							
Mimosaceae	*Acacia laccata*	-			a							
Mimosaceae	*Acacia leptostachya*	Townsville Wattle										
Mimosaceae	*Acacia longispicata*										a	
Mimosaceae	*Acacia melleodora*		a		s							
Mimosaceae	*Acacia multisiliqua*											
Mimosaceae	*Acacia platycarpa*	-										a
Mimosaceae	*Acacia ramiflora*	-	s									
Mimosaceae	*Acacia sericophylla*	-							a			a
Mimosaceae	*Acacia shirleyi*			a,d		d						
Mimosaceae	*Acacia sp.*	-										
Mimosaceae	*Acacia stipuligera*	-										

Mimosaceae	*Acacia tenuissima*	Narrow-leaved Wattle										
Mimosaceae	*Acacia tropica*	-			a							
Mimosaceae	*Archidendropsis basaltica*											
Moraceae	*Ficus rubiginosa forma glabrescens*	a Fig										
Myoporaceae	*Eremophila longifolia*											
Myoporaceae	*Eremophila sp.*	an Emubush										
Myoporaceae	*Myoporum acuminatum*	Waterbush										
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush										
Myrtaceae	*Calytrix microcoma*	Turkey Bush										
Myrtaceae	*Corymbia brachycarpa*	a Bloodwood			a		a	a			a	d
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum		a			a	5				
Myrtaceae	*Corymbia leichhardtii*	Yellowjacket		a,s		a						
Myrtaceae	*Corymbia plena*	a Bloodwood										
Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood			a	a						
Myrtaceae	*Eucalyptus brownii*	Reid River Box								d	a	
Myrtaceae	*Eucalyptus camaldulensis*								d			
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark										
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark	d		a			d				
Myrtaceae	*Eucalyptus exilipes*	Fine-leaved Ironbark										
Myrtaceae	*Eucalyptus fibrosa*	Broad-leaved Ironbark										
Myrtaceae	*Eucalyptus lamprophylla*	Shiny-leaved Bloodwood										
Myrtaceae	*Eucalyptus mediocris*											
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark					5					
Myrtaceae	*Eucalyptus persistens*	-										
Myrtaceae	*Eucalyptus similis*	Inland Yellow Jacket	d		d							

Myrtaceae	*Eucalyptus spp. mixed specimen*	a mallee eucalypt										
Myrtaceae	*Eucalyptus teretecornis*	Forest Red Gum										
Myrtaceae	*Homoranthus thomasii*											
Myrtaceae	*Lithomyrtus microphylla*											
Myrtaceae	*Melaleuca bracteata*	Black Tea-tree										
Myrtaceae	*Melaleuca chisholmii*	A paper bark										
Myrtaceae	*Melaleuca minutifolia*	-										
Myrtaceae	*Melaleuca nervosa*	a Paperbark					a	a	a			
Myrtaceae	*Melaleuca pallescens*	a Paperbark										
Myrtaceae	*Melaleuca sp.*	a Paperbark										
Myrtaceae	*Melaleuca tamariscina*	a Paperbark										
Myrtaceae	*Thryptomene parviflora*											
Nyctaginaceae	*Boerhavia sp.*											
Oleaceae	*Jasminum didymum*											
Oleaceae	*Jasminum lineare*	-										
Onagraceae	*Ludwigia octovalvis*	Native Willow Primrose										
Pentapetaceae	*Melhania ovata*											
Phormiaceae	*Dianella longifolia*	Blueberry Lily	a		a							
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush										
Phyllanthaceae	*Phyllanthus collinus*											
Phyllanthaceae	*Phyllanthus fuernrohrii*											
Phyllanthaceae	*Phyllanthus maderaspatensis*											
Phyllanthaceae	*Phyllanthus sp.*	-										
Phyllanthaceae	*Phyllanthus virgatus*	-										
Phyllanthaceae	*Sauropus elachophyllus*											
Picrodendraceae	*Petalostigma banksii*	Smooth-leaved Quinine	a			a						
Picrodendraceae	*Petalostigma pubescens*	Quinine Bush										a

Pittosporaceae	*Bursaria incana*	Mock Orange, Prickly Pine			a							
Poaceae	*Allopteropsis semialata*	Cockatoo Grass										
Poaceae	*Ancistrachne uncinulata*	Hooky Grass										
Poaceae	*Aristida caput-medusae*											
Poaceae	*Aristida holathera*											
Poaceae	*Aristida ingrata*	a Threeawn Grass			a				a		a	a
Poaceae	*Aristida pruinosa*	a Threeawn Grass				a	a	a	a	s	a	a
Poaceae	*Aristida sp.*											
Poaceae	*Arundinella nepalensis*	-										
Poaceae	*Bothriochloa bladhii var. bladhii*	Forest Bluegrass										
Poaceae	*Bothriochloa decipiens var. cloncurrensis*	Pitted Bluegrass										
Poaceae	*Bothriochloa ewartiana*	Desert Bluegrass			c							
Poaceae	*Bothriochloa sp.*							a	a		a	
Poaceae	*Capillipedium parviflorum*	Scented-top Grass										
Poaceae	*Cenchrus ciliaris**	Buffel Grass						d	d		a	a
Poaceae	*Cleistochloa subjuncea*	-		d		a						
Poaceae	*Cymbopogon bombycinus*	a Lemongrass			a						d	a
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass										
Poaceae	*Cynodon dactylon**	Couch Grass							a			
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass										
Poaceae	*Digitaria ammophila*	Silky Umbrella-grass										
Poaceae	*Digitaria breviglumis*											
Poaceae	*Digitaria ciliaris**	a Cockatoo Grass										
Poaceae	*Digitaria diminuta*	-										
Poaceae	*Digitaria gibbosa*											

Poaceae	*Echinochloa colona*	Awnless Barnyard Grass										
Poaceae	*Enneapogon lindleyanus*											
Poaceae	*Enneapogon polyphyllus*	-										
Poaceae	*Enneapogon robustissimus*	a Hedgehog Grass										
Poaceae	*Enneapogon sp.*											
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass										
Poaceae	*Eragrostis brownii*	Brown's Lovegrass										
Poaceae	*Eragrostis elongata*	Clustered Lovegrass						a			a	
Poaceae	*Eragrostis leptocarpa*											
Poaceae	*Eragrostis sororia*	a Lovegrass										
Poaceae	*Eragrostis sp.*							a			a	
Poaceae	*Eragrostis spartinoides*	a Lovegrass										
Poaceae	*Eragrostis speciosa*											
Poaceae	*Eriachne obtusa*	Northern Wandarrie Grass										
Poaceae	*Eulalia aurea*	-										
Poaceae	*Eulalia fulva*	Silky Browntop										
Poaceae	*Heteropogon contortus*	Black Speargrass			c				a		a	c
Poaceae	*Imperata cylindrica*	Bladey Grass										
Poaceae	*Leptochloa decipiens*											
Poaceae	*Leptochloa fusca subsp. fusca*	Brown Beetle Grass										
Poaceae	*Melinis repens**	Red Natal Grass										
Poaceae	*Panicum effusum*	Hairy Panic	a									
Poaceae	*Panicum larcomianum*	-										
Poaceae	*Panicum simile*											
Poaceae	*Panicum sp.*											

Poaceae	*Paspalidium caespitosum*	Brigalow Grass										
Poaceae	*Paspalidium distans*	-										
Poaceae	*Paspalum scrobiculatum*											
Poaceae	*Perotis rara*	Comet Grass										
Poaceae	*Sarga timorense*	-										
Poaceae	*Schizachyrium fragile*	Fire Grass										
Poaceae	*Sehima nervosum*	Rat's-tail Grass										
Poaceae	*Setaria surgens*	-	a									
Poaceae	*Sporobolus caroli*	Yakka Grass										
Poaceae	*Themeda avenacea*	Oat Kangaroo Grass										
Poaceae	*Themeda triandra*	Kangaroo Grass			a			a	a	d		
Poaceae	*Triodia longiceps*	Giant Grey Spinifex										
Poaceae	*Triodia molesta*			a		a	a					c
Poaceae	*Triodia pungens*	-	d		s	d						
Poaceae	*Urochloa piligera*	Hairy Armgrass										
Polygalaceae	*Comesperma sp.*	-										
Polygonaceae	*Comesperma pallidum*	-	a	a	a							
Polygonaceae	*Persicaria sp. (insufficient material)*	a Knotweed										
Proteaceae	*Grevillea decora*											
Proteaceae	*Grevillea glauca*	Bushman's Clothes Pegs	a									
Proteaceae	*Grevillea parallela*											
Proteaceae	*Grevillea pteridifolia*	Darwin Silky Oak										
Proteaceae	*Grevillea sessilis*	Silky Oak										
Proteaceae	*Hakea lorea*	Bootlace Oak										
Proteaceae	*Persoonia falcata*											
Proteaceae	*Persoonia sp.*	a Geebung										

Rhamnaceae	*Alphitonia excelsa*	Red Ash										
Rhamnaceae	*Ventilago viminalis*	Supple Jack							a			
Rubiaceae	*Everistia vacciniifolia var. vacciniifolia*	-										
Rubiaceae	*Pogonolobus reticulatus*											
Rubiaceae	*Psydrax attenuata*											
Rubiaceae	*Spermacoce brachystema*											
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood										
Rutaceae	*Geijera salicifolia*	Scrub Wilga										
Rutaceae	*Phebalium glandulosum*	Desert Phebalium										
Santalaceae	*Santalum lanceolatum*	Northern Sandlewood		a								
Sapindaceae	*Atalaya hemiglauca*	Whitewood									a	
Sapindaceae	*Atalaya sp.*	-										
Sapindaceae	*Distichostemon dodecandra*	a Hopbush	a									
Sapindaceae	*Dodonaea filifolia*	a Hopbush		a								
Sapindaceae	*Dodonaea lanceolata*	a Hopbush	a									
Scrophulariaceae	*Eremophila mitchellii*	False Sandalwood										
Scrophulariaceae	*Scoparia dulcis*	Goatweed										
Solanaceae	*Solanum ferocissimum*	Spiny Potato Bush										
Solanaceae	*Solanum parviflorum*	-										
Solanaceae	*Solanum sp.*	-										
Sparrmanniaceae	*Grewia retusifolia*	Dog's Balls						a	a			
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia	a									
Stylidiaceae	*Stylidium eriorhizum*	-										
Violaceae	*Hybanthus enneaspermus*	Blue Spade Flower										
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	a Grass Tree										

Plant Species List and Quadrat Data - Quadrats 71 to 77												
Family	**Scientific Name**	**Common Name**	**Q71**	**Q72**	**Q73**	**Q74**	**Q75**	**Q76**	**Q77**			
Acanthaceae	*Brunoniella australis*	Blue Trumpet										
Acanthaceae	*Pseuderanthemum variabile*											
Acanthaceae	*Rostellularia adscendens*	-										
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern										
Adiantaceae	*Cheilanthes sieberi*	-										
Amaranthaceae	*Achyranthes aspera*	Chaff Flower										
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed										
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed										
Anthericaceae	*Tricoryne anceps*	-										
Apiaceae	*Eryngium plantagineum*	Long Eryngium										
Apiaceae	*Platysace valida*											
Apocynaceae	*Alstonia constricta*											
Apocynaceae	*Carissa lanceolata*	Currant Bush										
Apocynaceae	*Carissa ovata*	Currant Bush	a			a		a	a			
Apocynaceae	*Marsdenia microlepis*	-		a								
Apocynaceae	*Parsonsia eucalyptophylla*	Gargaloo										
Apocynaceae	*Parsonsia lanceolata*											
Asteraceae	*Calotis sp.*	a Burr-daisy										
Asteraceae	*Camptacra barbata*	-										
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting						a				
Asteraceae	*Coronidium glutinosum*											
Asteraceae	*Cyanthillium cinereum*											
Asteraceae	*Emilia sonchifolia*	Lilac Tasselflower										
Asteraceae	*Epaltes australis**	-										
Asteraceae	*Parthenium hysterophorus*											

Asteraceae	*Peripleura bicolor*											
Asteraceae	*Peripleura virgata*	-										
Asteraceae	*Pterocaulon redolens*	Rag Weed, Pintye-Pintye										
Asteraceae	*Pterocaulon serrulatum*		a				a					
Asteraceae	*Rutidosis leucantha*											
Asteraceae	*Senecio brigalowensis*											
Asteraceae	*Vittadinia pustulata*	a Fuzzweed										
Asteraceae	*Wedelia spilanthoides*											
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine										
Boraginaceae	*Heliotropium sp.*											
Byttneriaceae	*Keraudrenia collina*	-										
Byttneriaceae	*Waltheria indica*											
Caesalpiniaceae	*Chamaecrista absus*											
Caesalpiniaceae	*Chamaecrista concinna*	-										
Caesalpiniaceae	*Chamaecrista mimosoides*											
Caesalpiniaceae	*Chamaecrista nomame*											
Caesalpiniaceae	*Lysiphyllum carronii*											
Caesalpiniaceae	*Senna costata*	-										
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell										
Campanulaceae	*Wahlenbergia gracilis*	a Bluebell										
Campanulaceae	*Wahlenbergia sp.*											
Capparaceae	*Capparis canescens*	-										
Capparaceae	*Capparis lasiantha*	Nepine										
Caryophyllaceae	*Polycarpaea corymbosa*											
Celastraceae	*Maytenus cunninghamii*	Western Rosewood	a			a		a	a			
Chenopodiaceae	*Einadia nutans*	climbing saltbush										

Clusiaceae	*Hypericum gramineum*	Small St John's Wort										
Combretaceae	*Terminalia oblongata*	Yellow-wood			a							
Convolvulaceae	*Evolvulus alsinoides*											
Convolvulaceae	*Ipomoea sp.*											
Cyperaceae	*Abildgaardia ovata*											
Cyperaceae	*Bulbostylis barbata*	Watergrass										
Cyperaceae	*Cyperus conicus*	-										
Cyperaceae	*Cyperus difformis*	Dirty Dora										
Cyperaceae	*Cyperus flaccidus*	Lax Flat-sedge										
Cyperaceae	*Cyperus fulvus*	Sticky Sedge										
Cyperaceae	*Cyperus gracilis*											
Cyperaceae	*Cyperus holoschoenus*											
Cyperaceae	*Cyperus lucidus*	Leafy Flat Sedge										
Cyperaceae	*Eleocharis plana*	Flat Spike-sedge										
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge										
Cyperaceae	*Gahnia aspera*	Saw Sedge										
Cyperaceae	*Schoenoplectus dissachanthus*	Blunt Club-sedge										
Cyperaceae	*Schoenoplectus lateriflorus*	-										
Cyperaceae	*Schoenus kennyi*	-										
Cyperaceae	*Scleria mackaviensis*											
Cyperaceae	*Scleria sphacelata*											
Cyperaceaee	*Cyperus perangustus*	Umbrella Sedge										
Droseraceae	*Drosera burmanni*	a Sundew										
Droseraceae	*Drosera indica*	Flycatcher										
Euphorbiaceae	*Beyeria viscosa*	a Wallaby Bush										
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed										
Euphorbiaceae	*Euphorbia mitchelliana*	a Spurge										

Fabaceae	*Aeschynomene indica*											
Fabaceae	*Cajanus marmoratus*	-										
Fabaceae	*Crotalaria medicaginea*											
Fabaceae	*Crotalaria mitchellii subsp. mitchellii*	Yellow Rattlepod										
Fabaceae	*Crotalaria montana*	a Rattlepod										
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil										
Fabaceae	*Desmodium varians*	Slender Tick-trefoil										
Fabaceae	*Erythrina verspetilio*	Native Coral Tree										
Fabaceae	*Galactia tenuiflora*	a Lovecreeper										
Fabaceae	*Gastrolobium grandiflorum*	Heart-leaf Poison Bush			a							
Fabaceae	*Glycine clandestina*	a Lovecreeper										
Fabaceae	*Glycine sp. (Mackay SBAndrews+43)*											
Fabaceae	*Glycine tomentella*	a Lovecreeper										
Fabaceae	*Hovea parvicalyx*	-										
Fabaceae	*Indigo linifolia*	Narrow-leaf Indigo										
Fabaceae	*Indigofera colutea*											
Fabaceae	*Indigofera haplophylla*											
Fabaceae	*Indigofera hirsuta*	Hairy Indigo										
Fabaceae	*Indigofera linifolia*	-										
Fabaceae	*Indigofera linnaei*	Birdsville Indigo										
Fabaceae	*Indigofera pratensis*											
Fabaceae	*Indigofera sp. (Aramac E.J.Thompson+ JER177*	-										
Fabaceae	*Jacksonia ramosissima*	a Dogwood										
Fabaceae	*Jacksonia rhadinoclada*											
Fabaceae	*Labichea rupestris*	-										
Fabaceae	*Mirbelia aotoides*											

Fabaceae	*Mirbelia viminalis*											
Fabaceae	*Rhynchosia minima*											
Fabaceae	*Stylosanthes scabra**	a Rattlepod	a					a				
Fabaceae	*Tephrosia brachyodon*	-										
Fabaceae	*Tephrosia juncea*	-										
Fabaceae	*Tephrosia leptoclada*											
Fabaceae	*Uraria lagopodioides*	Prickitch										
Fabaceae	*Vigna lanceolata*	Maloga Bean										
Fabaceae	*Zornia areolata*											
Fabaceae	*Zornia dyctiocarpa var. Filifolia*											
Gentiaceae	*Schenkia australis*	-										
Goodeniaceae	*Goodenia armitiana*											
Goodeniaceae	*Goodenia gracilis*	Slender Goodenia										
Goodeniaceae	*Goodenia grandiflora*	-										
Goodeniaceae	*Goodenia hederacea*											
Goodeniaceae	*Goodenia sp.*	-										
Goodeniaceae	*Goodenia splendida*	-										
Haloragaceae	*Gonocarpus sp.*											
Juncaceae	*Juncus continuus*	-										
Lamiaceae	*Prostanthera parviflora*	-										
Lauraceae	*Cassytha filiformis*				a			a	a			
Lauraceae	*Cassytha glabella*											
Lobeliaceae	*Pratia purpurascens*	Whiteroot										
Lomandraceae	*Lomandra leucocephala*	Woolly Mat-rush										
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush										
Lomandraceae	*Lomandra multiflora*	Many Flowered Matrush										
Loranthaceae	*Amyema quandang*											

Lythraceae	*Rotala mexicana*	-										
Malvaceae	*Hibiscus meraukensis*											
Malvaceae	*Sida cordifolia*			a								
Malvaceae	*Sida cunninghamiana*	Ridged Sida			a							
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne										
Malvaceae	*Sida spinosa**	Arrow-leaf Sida										
Marsileaceae	*Marsilea hirsuta*	Hansen's Nardoo										
Mimosaceae	*Acacia cowleana*	Halls Creek Wattle	a	a	a	a	a	d	a			
Mimosaceae	*Acacia dietrichiana*											
Mimosaceae	*Acacia elachantha*	-										
Mimosaceae	*Acacia excelsa*	-										
Mimosaceae	*Acacia farnesiana*											
Mimosaceae	*Acacia galioides*	-										
Mimosaceae	*Acacia gnidium*	-										
Mimosaceae	*Acacia holosericea*	Soapbush Wattle										
Mimosaceae	*Acacia hyaloneura*	-										
Mimosaceae	*Acacia laccata*	-										
Mimosaceae	*Acacia leptostachya*	Townsville Wattle			d							
Mimosaceae	*Acacia longispicata*											
Mimosaceae	*Acacia melleodora*						a					
Mimosaceae	*Acacia multisiliqua*											
Mimosaceae	*Acacia platycarpa*	-										
Mimosaceae	*Acacia ramiflora*	-										
Mimosaceae	*Acacia sericophylla*	-	a	a		a		a	a			
Mimosaceae	*Acacia shirleyi*											
Mimosaceae	*Acacia sp.*	-										
Mimosaceae	*Acacia stipuligera*	-										

Mimosaceae	*Acacia tenuissima*	Narrow-leaved Wattle				a	a					
Mimosaceae	*Acacia tropica*	-										
Mimosaceae	*Archidendropsis basaltica*											
Moraceae	*Ficus rubiginosa forma glabrescens*	a Fig										
Myoporaceae	*Eremophila longifolia*											
Myoporaceae	*Eremophila sp.*	an Emubush										
Myoporaceae	*Myoporum acuminatum*	Waterbush										
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush										
Myrtaceae	*Calytrix microcoma*	Turkey Bush										
Myrtaceae	*Corymbia brachycarpa*	a Bloodwood										
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum		a		a						
Myrtaceae	*Corymbia leichhardtii*	Yellowjacket										
Myrtaceae	*Corymbia plena*	a Bloodwood										
Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood			a	a	a					
Myrtaceae	*Eucalyptus brownii*	Reid River Box										
Myrtaceae	*Eucalyptus camaldulensis*											
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark										
Myrtaceae	*Eucalyptus crebra*	Narrow Leaved Ironbark	d	d			d	d	d			
Myrtaceae	*Eucalyptus exilipes*	Fine-leaved Ironbark										
Myrtaceae	*Eucalyptus fibrosa*	Broad-leaved Ironbark										
Myrtaceae	*Eucalyptus lamprophylla*	Shiny-leaved Bloodwood										
Myrtaceae	*Eucalyptus mediocris*											
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark	a									
Myrtaceae	*Eucalyptus persistens*	-										
Myrtaceae	*Eucalyptus similis*	Inland Yellow Jacket			a	d	a					

Myrtaceae	*Eucalyptus spp. mixed specimen*	a mallee eucalypt										
Myrtaceae	*Eucalyptus teretecornis*	Forest Red Gum										
Myrtaceae	*Homoranthus thomasii*											
Myrtaceae	*Lithomyrtus microphylla*											
Myrtaceae	*Melaleuca bracteata*	Black Tea-tree										
Myrtaceae	*Melaleuca chisholmii*	A paper bark										
Myrtaceae	*Melaleuca minutifolia*	-										
Myrtaceae	*Melaleuca nervosa*	a Paperbark										
Myrtaceae	*Melaleuca pallescens*	a Paperbark										
Myrtaceae	*Melaleuca sp.*	a Paperbark										
Myrtaceae	*Melaleuca tamariscina*	a Paperbark										
Myrtaceae	*Thryptomene parviflora*											
Nyctaginaceae	*Boerhavia sp.*											
Oleaceae	*Jasminum didymum*											
Oleaceae	*Jasminum lineare*	-										
Onagraceae	*Ludwigia octovalvis*	Native Willow Primrose										
Pentapetaceae	*Melhania ovata*											
Phormiaceae	*Dianella longifolia*	Blueberry Lily										
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush										
Phyllanthaceae	*Phyllanthus collinus*											
Phyllanthaceae	*Phyllanthus fuernrohrii*											
Phyllanthaceae	*Phyllanthus maderaspatensis*											
Phyllanthaceae	*Phyllanthus sp.*	-										
Phyllanthaceae	*Phyllanthus virgatus*	-										
Phyllanthaceae	*Sauropus elachophyllus*											
Picrodendraceae	*Petalostigma banksii*	Smooth-leaved Quinine										
Picrodendraceae	*Petalostigma pubescens*	Quinine Bush						a	a			

Pittosporaceae	*Bursaria incana*	Mock Orange, Prickly Pine				a						
Poaceae	*Allopteropsis semialata*	Cockatoo Grass										
Poaceae	*Ancistrachne uncinulata*	Hooky Grass										
Poaceae	*Aristida caput-medusae*											
Poaceae	*Aristida holathera*											
Poaceae	*Aristida ingrata*	a Threeawn Grass										
Poaceae	*Aristida pruinosa*	a Threeawn Grass	a	a		a	a	a	a			
Poaceae	*Aristida sp.*											
Poaceae	*Arundinella nepalensis*	-										
Poaceae	*Bothriochloa bladhii var. bladhii*	Forest Bluegrass										
Poaceae	*Bothriochloa decipiens var. cloncurrensis*	Pitted Bluegrass										
Poaceae	*Bothriochloa ewartiana*	Desert Bluegrass										
Poaceae	*Bothriochloa sp.*			a				a				
Poaceae	*Capillipedium parviflorum*	Scented-top Grass										
Poaceae	*Cenchrus ciliaris**	Buffel Grass	s			a	a					
Poaceae	*Cleistochloa subjuncea*	-					a					
Poaceae	*Cymbopogon bombycinus*	a Lemongrass		a		c		c	a			
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass										
Poaceae	*Cynodon dactylon**	Couch Grass										
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass										
Poaceae	*Digitaria ammophila*	Silky Umbrella-grass										
Poaceae	*Digitaria breviglumis*											
Poaceae	*Digitaria ciliaris**	a Cockatoo Grass										
Poaceae	*Digitaria diminuta*	-										
Poaceae	*Digitaria gibbosa*											

Poaceae	*Echinochloa colona*	Awnless Barnyard Grass										
Poaceae	*Enneapogon lindleyanus*											
Poaceae	*Enneapogon polyphyllus*	-										
Poaceae	*Enneapogon robustissimus*	a Hedgehog Grass										
Poaceae	*Enneapogon sp.*					a	a		a			
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass										
Poaceae	*Eragrostis brownii*	Brown's Lovegrass										
Poaceae	*Eragrostis elongata*	Clustered Lovegrass										
Poaceae	*Eragrostis leptocarpa*											
Poaceae	*Eragrostis sororia*	a Lovegrass										
Poaceae	*Eragrostis sp.*											
Poaceae	*Eragrostis spartinoides*	a Lovegrass										
Poaceae	*Eragrostis speciosa*											
Poaceae	*Eriachne obtusa*	Northern Wandarrie Grass										
Poaceae	*Eulalia aurea*	-										
Poaceae	*Eulalia fulva*	Silky Browntop										
Poaceae	*Heteropogon contortus*	Black Speargrass	a	a	a		s	c	c			
Poaceae	*Imperata cylindrica*	Bladey Grass										
Poaceae	*Leptochloa decipiens*											
Poaceae	*Leptochloa fusca subsp. fusca*	Brown Beetle Grass										
Poaceae	*Melinis repens**	Red Natal Grass										
Poaceae	*Panicum effusum*	Hairy Panic				a						
Poaceae	*Panicum larcomianum*	-										
Poaceae	*Panicum simile*											
Poaceae	*Panicum sp.*											

Poaceae	*Paspalidium caespitosum*	Brigalow Grass										
Poaceae	*Paspalidium distans*	-										
Poaceae	*Paspalum scrobiculatum*											
Poaceae	*Perotis rara*	Comet Grass										
Poaceae	*Sarga timorense*	-										
Poaceae	*Schizachyrium fragile*	Fire Grass										
Poaceae	*Sehima nervosum*	Rat's-tail Grass										
Poaceae	*Setaria surgens*	-										
Poaceae	*Sporobolus caroli*	Yakka Grass										
Poaceae	*Themeda avenacea*	Oat Kangaroo Grass										
Poaceae	*Themeda triandra*	Kangaroo Grass	d		s	c	d		a			
Poaceae	*Triodia longiceps*	Giant Grey Spinifex										
Poaceae	*Triodia molesta*		a		d	c	s	c	c			
Poaceae	*Triodia pungens*	-										
Poaceae	*Urochloa piligera*	Hairy Armgrass										
Polygalaceae	*Comesperma sp.*	-										
Polygonaceae	*Comesperma pallidum*	-										
Polygonaceae	*Persicaria sp. (insufficient material)*	a Knotweed										
Proteaceae	*Grevillea decora*											
Proteaceae	*Grevillea glauca*	Bushman's Clothes Pegs										
Proteaceae	*Grevillea parallela*											
Proteaceae	*Grevillea pteridifolia*	Darwin Silky Oak						a				
Proteaceae	*Grevillea sessilis*	Silky Oak										
Proteaceae	*Hakea lorea*	Bootlace Oak										
Proteaceae	*Persoonia falcata*											
Proteaceae	*Persoonia sp.*	a Geebung										

Rhamnaceae	*Alphitonia excelsa*	Red Ash										
Rhamnaceae	*Ventilago viminalis*	Supple Jack	a	a								
Rubiaceae	*Everistia vacciniifolia var. vacciniifolia*	-										
Rubiaceae	*Pogonolobus reticulatus*											
Rubiaceae	*Psydrax attenuata*											
Rubiaceae	*Spermacoce brachystema*											
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood										
Rutaceae	*Geijera salicifolia*	Scrub Wilga										
Rutaceae	*Phebalium glandulosum*	Desert Phebalium										
Santalaceae	*Santalum lanceolatum*	Northern Sandlewood				a						
Sapindaceae	*Atalaya hemiglauca*	Whitewood										
Sapindaceae	*Atalaya sp.*	-										
Sapindaceae	*Distichostemon dodecandra*	a Hopbush										
Sapindaceae	*Dodonaea filifolia*	a Hopbush										
Sapindaceae	*Dodonaea lanceolata*	a Hopbush										
Scrophulariaceae	*Eremophila mitchellii*	False Sandalwood										
Scrophulariaceae	*Scoparia dulcis*	Goatweed										
Solanaceae	*Solanum ferocissimum*	Spiny Potato Bush										
Solanaceae	*Solanum parviflorum*	-										
Solanaceae	*Solanum sp.*	-										
Sparrmanniaceae	*Grewia retusifolia*	Dog's Balls										
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia										
Stylidiaceae	*Stylidium eriorhizum*	-										
Violaceae	*Hybanthus enneaspermus*	Blue Spade Flower										
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	a Grass Tree										

** Introduced species*

D Code *Relative Dominance*

d=dominant		*Species that contributes most to overall above-ground biomass of a stratum*
c=codominant	*³*	*2 spp. contribute equally to dominant above-ground biomass of a stratum*
s=subdominant		*less than dom. spp but ³ 10% of total biomass of the stratum*
a=associated		*Any species present but contributes < 10% of total biomass in stratum*

CUMBERLAND ECOLOGY

Table J.2 Flora Quadrat Site Coordinates

Quadrat	Easting	Northing
1	416577	7583784
2	416175	7581660
3	407869	7592972
4	408624	7593351
5	410023	7592540
6	408581	7592500
7	415832	7580749
8	412160	7590385
9	411308	7591500
10	411955	7591376
11	412410	7589874
12	415656	7587642
13	414959	7592645
14	408870	7594681
15	408773	7594889
16	409283	7589422
17	409197	7589401
18	419057	7581081
19	421482	7584839
20	415165	7585643
21	414958	7584053
22	415230	7580647
23	421039	7590526
24	422774	7589324
25	408433	7602514
26	408675	7602422
27	409351	7597087
28	409674	7599115
29	409650	7599175
30	409916	7603993
31	409162	7603458
32	408034	7602172
33	407262	7599298
34	412521	7592515
35	408100	7598380

Quadrat	Easting	Northing
36	408911	7597432
37	409494	7594177
38	422057	7580655
39	420807	7580733
40	419062	7582403
41	411791	7587742
42	411841	7587757
43	412806	7587681
44	413012	7587712
45	412801	7588191
46	415073	7592716
47	415112	7592504
48	414482	7592017
49	413420	7591327
50	415029	7590252
51	409542	7596256
52	409987	7596215
53	409336	7596861
54	409774	7596889
55	414992	7581054
56	410378	7607014
57	410243	7607045
58	407932	7607910
59	407194	7607345
60	407235	7607337
61	409752	7590481
62	409407	7590119
63	414085	7585101
64	414128	7584745
65	416575	7588940
66	418691	7588542
67	420618	7586466
68	421260	7583106
69	420505	7583341
70	418151	7584556
71	417038	7586937

Quadrat	Easting	Northing
72	416932	7591152
73	419016	7591907
74	420402	7591547
75	422039	7588261
76	422045	7591072
77	419769	7589832

Appendix K

Recorded Fauna Species

Table K.1 Fauna Species Recorded within the Study Area

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
		EPBC Act	NC Act[2]	May-12	Oct/Nov 2012	Oct-13	May-12	Oct/Nov 2012	Oct-13
Amphibians									
Litoria caerulea	Green Tree Frog	-	-	X	X		FT4, SL2	SL5	
Litoria inermis	Peter's Frog	-	-	X	X		AR4, AR16	AR26, PT6, FT11, FT12, SL5, SL6, SL8	
Litoria rothii	Roth's Tree Frog	-	-	X	X		I	SL8	
Litoria rubella	Red Tree Frog	-	-	X	X		SL2	SL6	
Limnodynastes tasmaniensis	Spotted Grass Frog	-	-	X	X		AR17	PT5, FT11	
Platyplectrum ornatum	Ornate Burrowing Frog	-	-	X	X		FT2, FT4	PT3, SL3	
Uperoleia littlejohni	Littlejohn's Toadlet	-	-	X			FT2, FT4		
Rhinella marinus	Cane Toad*	-	-	X	X	X	FT4, SL1, SL2, AR4, AR15, AR17	SL4, SL6, SL8, IR10	IR16
Reptiles									
Diplodactylus vittatus	Eastern Stone Gecko	-	-	X			AR14		

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Gehyra dubia	Dubious Dtella	-	-	X	X		AR15, AR17	SL4	
Heteronotia binoei	Bynoe's Gecko	-	-	X	X		SL2, AR11, AR13	AR20	
Nephrurus asper	Prickly Knob-tailed Gecko	-	-	X			AR12		
Oedura marmorata	Marbled Velvet Gecko	-	-	X			FT5, SL2		
Amphiloburus nobbi	Nobbi Dragon	-	-	X	X		I	FT7	
Ctenophorus nuchalis	Central Netted Dragon	-	-	X			I		
Diporiphora australis	Tommy Roundhead Dragon	-	-	X	X		FT3, AR2, AR9, AR10, AR11	AR27, AR37, AR39	
Varanus storri	Storr's Monitor	-	-	X		X	AR12		AR46
Varanus gouldii	Sand Goanna	-	-		X			I	
Carlia munda		-	-	X		X	FT2, AR9, AR13		AR44
Cryptoblepharus carnabyi		-	-	X	X		AR1, AR17, AR18, AR19	AR26, AR29, AR37	
Ctenotus ingrami		-	-	X	X		FT4, AR3, AR5, AR6, AR10, AR14	AR23, AR25, AR26, AR37	
Egernia striolata	Tree Skink	-	-		X			AR20, AR23, AR36	
Menetia timlowi	Dwarf Litter-skink	-	-		X			AR31	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Morethia taeniopleura		-	-	X			AR6, AR10, AR14		
Tiliqua scincoides	Eastern Blue-tongue	-	-	X			EC4		
Furina diadema	Red-naped Snake	-	-	X			FT2		
Brachyurophis australis	Australian Coral Snake	-	-	X	X		I	I	
Chlamydosaurus kingii	Frill-necked Lizard	-	-		X			I	
Dendrelaphis punctulata	Green Tree Snake	-	-		X			I	
Acanthophis antarcticus	Common Death Adder	-	NT		X			I	
Birds									
Struthidea cinerea	Apostlebird	-	-	X	X		I	BS33, BS34	
Anhinga novaehollandiae	Australasian Darter	-	-	X	X		BS1	BS21, BS34	
Tachybaptus novaehollandiae	Australasian Grebe	-	-	X	X		BS1	BS34	
Anthus novaeseelandiae	Australasian Pipit	M	-	X		X	I		BS44, BS45, BS50, BS56
Ardeotis australis	Australian Bustard	-	-	X	X		I	I	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Cracticus tibicen	Australian Magpie	-	-	X	X	X	BS2, BS4, BS5, BS12, BS17	BS20, BS21, BS26, BS27	BS44
Aegotheles cristatus	Australian Owlet-nightjar	-	-	X	X		I	SL7	
Pelecanus conspicillatus	Australian Pelican	M	-		X			BS34	
Corvus coronoides	Australian Raven	-	-		X			BS20, BS27	
Chenonetta jubata	Australian Wood Duck	-	-	X	X		BS1, BS7, BS17	BS34	
Geopelia humeralis	Bar-shouldered Dove	-	-	X	X	X	I	BS20, BS25, IR15	BS47
Coracina novaehollandiae	Black-faced Cuckoo-shrike	M	-	X	X	X	BS11, BS17	BS20, BS27, BS39	BS43, BS44, BS50
Artamus cinereus	Black-faced Woodswallow	-	-	X	X	X	I	BS27, BS42	BS43, BS57
Elseyornis melanops	Black-fronted Dotterel	-	-		X			BS34	
Tribonyx ventralis	Black-tailed Native-hen	-	-		X			BS34	
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	E	E	X	X	X	I	I	BS45
Himantopus himantopus	Black-winged Stilt	M	-		X			BS27, BS32, BS34, SL5	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Entomyzon cyanotis	Blue-faced Honeyeater	-	-	X	X		BS4	I	
Dacelo leachii	Blue-winged Kookaburra	-	-	X	X		I	BS20, BS21, BS26, BS32	
Grus rubicunda	Brolga	-	-	X	X		I	BS21, BS27, BS34, SL5	
Falco berigora	Brown Falcon	-	-	X	X		I	BS42	
Accipiter fasciatus	Brown Goshawk	M	-		X			IR10	
Lichmera indistincta	Brown Honeyeater	-	-	X	X	X	BS4, BS5, BS6, BS8, BS9, BS10, BS15	BS19, BS23, BS25, BS26, BS36, BS37, BS38	BS57
Coturnix ypsilophora	Brown Quail	-	-	X			BS11		
Cincloramphus cruralis	Brown Songlark	-	-	X			BS2		
Climacteris picumnus	Brown Treecreeper	-	-	X	X		I	BS27, BS34	
Melopsittacus undulatus	Budgerigar	-	-	X		X	BS7, BS11		BS54
Acanthiza reguloides	Buff-rumped Thornbill	-	-	X	X		BS12	BS25, BS28, BS30	
Burhinus grallarius	Bush Stone-curlew	-	-		X			SL4, SL5	
Scythrops	Channel-billed Cuckoo	M	-		X			I	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
novaehollandiae									
Phaps chalcoptera	Common Bronzewing	-	-	X	X	X	BS15	BS25, BS32, IR10, IR15	BS43, IR16
Oreoica gutturalis	Crested Bellbird	-	-	X	X	X	I	BS41, BS42	BS44, BS56
Ocyphaps lophotes	Crested Pigeon	-	-		X	X		BS27	IR16
Geopelia cuneata	Diamond Dove	-	-	X	X	X	I	I	BS47, IR16
Eurystomus orientalis	Dollarbird	M	-		X			BS20, BS21, BS34	
Taeniopygia bichenovii	Double-barred Finch	-	-	X	X	X	BS3, BS4, BS8, BS11, BS13, BS17	BS25, BS40, IR10, IR15	BS43, BS48, BS55, IR16
Gallinula tenebrosa	Dusky Moorhen	-	-	X	X		BS1	BS21, BS34	
Artamus cyanopterus	Dusky Woodswallow	-	-			X			I
Tyto javanica	Eastern Barn Owl	-	-		X			SL8	
Ardea modesta	Eastern Great Egret	M+, Mi	-	X			I		
Dromaius novaehollandiae	Emu	-	-	X	X	X	BS18	I	IR16
Petrochelidon ariel	Fairy Martin	-	-		X			I	
Lichenostomus fuscus	Fuscous Honeyeater	-	-	X				BS20	
Cracticus torquatus	Grey Butcherbird	-	-	X	X		BS15, BS16,	BS27	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
							BS18		
Rhipidura albiscapa	Grey Fantail	-	-	X		X	BS6, BS7, BS8, BS9, BS11, BS12, BS13, BS14, BS15, BS16		BS49, BS54
Colluricincla harmonica	Grey Shrike-thrush	-	-	X	X	X	BS13	BS19, BS20, BS25, BS35, BS36	BS51
Anas gracilis	Grey Teal	-	-	X	X		BS7	BS34	
Pomatostomus temporalis	Grey-crowned Babbler	-	-	X	X	X	BS17	BS20, BS21, BS26, BS34, IR10	BS44
Lichenostomus plumulus	Grey-fronted Honeyeater	-	-	X		X	I		BS44
Lichenostomus keartlandi	Grey-headed Honeyeater	-	-	X			BS11		
Poliocephalus poliocephalus	Hoary-headed Grebe	-	-	X			BS1		
Melanodryas cucullata	Hooded Robin	-	-	X		X	BS11		BS46, BS57
Mirafra javanica	Horsfield's Bushlark	-	-	X		X	I		BS43, BS45, BS57

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Acanthiza apicalis	Inland Thornbill	-	-			X			BS44
Ardea intermedia	Intermediate Egret	M	-	X	X	X	BS1, BS7	BS34	BS49
Microeca fascinans	Jacky Winter	-	-	X	X	X	BS11	BS22	BS43, BS44, BS45, BS46, BS47, BS48, BS54, BS57, BS58
Dacelo novaeguineae	Laughing Kookaburra	-	-	X	X	X	BS6, BS15	BS19, BS20, BS24, BS26, IR10, IR11	BS50
Myiagra rubecula	Leaden Flycatcher	-	-		X			BS20, BS25	
Hieraaetus morphnoides	Little Eagle	-	-		X			I	
Philemon citreogularis	Little Friarbird	-	-		X	X		BS19, BS20, BS21, BS22, BS32, BS35, IR10, IR11	BS43, BS44, BS46, BS47, IR16
Phalacrocorax sulcirostris	Little Black Cormorant	-	-		X			I	
Microcarbo melanoleucos	Little Pied Cormorant	-	-		X			I	
Artamus minor	Little Woodswallow	-	-		X			I	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Grallina cyanoleuca	Magpie-lark	M	-	X	X	X	BS1, BS7, BS11, IR2	BS20, BS21, BS27, BS34	BS43, BS44, BS46, BS50
Vanellus miles	Masked Lapwing	-	-	X	X		BS1	BS21, BS34	
Artamus personatus	Masked Woodswallow	-	-		X			BS21, BS22	
Dicaeum hirundinaceum	Mistletoebird	-	-	X	X		BS13	BS25, BS36	
Falco cenchroides	Nankeen Kestrel	-	-		X			BS27	
Philemon corniculatus	Noisy Friarbird	-	-	X	X		BS4, BS5, BS6, BS9, BS10, BS15, BS16	BS20, BS21, BS22, BS25, BS26, BS27, BS31, BS32, BS34, BS36, BS40, IR10, IR11, IR15	
Manorina melanocephala	Noisy Miner	-	-			X			BS43, BS44, BS45, BS47, BS50
Oriolus sagittatus	Olive-backed Oriole	-	-	X	X	X	BS6	BS20, BS21, BS22, BS25, BS39	BS44
Epthianura aurifrons	Orange Chat	-	-			X			BS48
Aviceda subcristata	Pacific Baza	-	-		X			I	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Anas superciliosa	Pacific Black Duck	-	-	X	X		BS1, BS7	BS34	
Platycercus adscitus	Pale-headed Rosella	-	-	X	X	X	BS1, BS3, BS6, BS7, BS17	BS20, BS21, BS25, BS26, BS27, BS34, BS39, IR10, IR11, IR15	BS43, BS44, BS46, BS47, IR16
Cacomantis pallidus	Pallid Cuckoo	-	-		X			BS20	
Geopelia striata	Peaceful Dove	-	-	X	X	X	BS8, BS12, BS17	BS20, BS21, BS24, BS25, BS27, BS34, IR10, IR15	BS47
Falco peregrinus	Peregrine Falcon	-	-		X			IR15	
Centropus phasianinus	Pheasant Coucal	-	-	X	X		I	BS20, BS21, BS25, BS32	
Cracticus nigrogularis	Pied Butcherbird	-	-	X	X	X	BS6, BS7, BS8, BS11, BS13, BS17	BS19, BS20, BS21, BS23, BS26, BS27, BS41	BS43, BS44, BS45, BS57, BS58
Strepera graculina	Pied Currawong	-	-	X	X		I	BS19, BS25, BS28, BS36, IR15	
Dendrocygna eytoni	Plumed Whistling-Duck	-	-	X	X		BS7	BS34	
Neochmia modesta	Plum-headed Finch	-	-	X			I		

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Merops ornatus	Rainbow Bee-eater	Mi, M	-		X	X		BS20, BS21, BS22	BS46, BS48
Trichoglossus haematodus	Rainbow Lorikeet	-	-	X	X		BS17	BS21, BS34	
Malurus melanocephalus	Red-backed Fairy-wren	-	-	X	X	X	BS11, BS13	BS29, BS30, BS33, BS34, BS35, BS40, BS41, BS42	BS44, BS45, BS46, BS54
Todiramphus pyrrhopygius	Red-backed Kingfisher	-	-	X			BS11		
Pardalotus rubricatus	Red-browed Pardalote	-	-			X			BS45, BS50
Turnix pyrrhothorax	Red-chested Button-quail	-	-	X			I		
Calyptorhynchus banksii	Red-tailed Black-Cockatoo	-	-	X	X		I	BS25, BS31, BS32	
Aprosmictus erythropterus	Red-winged Parrot	-	-	X	X	X	BS6	BS21	BS43, BS46, BS54, IR16
Myiagra inquieta	Restless Flycatcher	-	-	X	X	X	BS1, BS11	BS20, BS21, BS34, BS42	BS55
Platalea regia	Royal Spoonbill	-	-		X			BS27	
Cincloramphus mathewsi	Rufous Songlark	-	-	X	X	X	I	BS40, BS42	BS58

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Pachycephala rufiventris	Rufous Whistler	-	-	X	X	X	BS8, BS9, BS11, BS12, BS13, BS17	BS19, BS20, BS23, BS26, BS29, BS30, BS37, BS38, BS39, BS41, BS42	BS43, BS44, BS45, BS46, BS48, BS56
Todiramphus sanctus	Sacred Kingfisher	M	-	X	X		BS1, BS17	BS20, BS21, BS28, BS34	
Myiagra cyanoleuca	Satin Flycatcher	Mi, M	-			X			I
Chalcites lucidus	Shining Bronze-Cuckoo	-	-	X			BS16		
Lichenostomus virescens	Singing Honeyeater	-	-	X		X	BS11, BS12		BS43, BS44, BS46, BS55, BS57
Ninox novaeseelandiae	Southern Boobook	M	-	X	X		BS10	SL3, SL4, SL5, SL6, SL7, SL8	
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	-	-	X			I		
Ptilonorhynchus maculatus	Spotted Bowerbird	-	-			X			BS43, BS55, IR16
Eurostopodus argus	Spotted Nightjar	M	-		X			SL8	
Pardalotus punctatus	Spotted Pardalote	-	-			X			BS54
Geophaps scripta	Squatter Pigeon	V	V	X	X	X	I	I	I

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
scripta	(southern subspecies)								
Threskiornis spinicollis	Straw-necked Ibis	M	-	X	X		I	BS34	
Pardalotus striatus	Striated Pardalote	-	-	X	X	X	BS2, BS3, BS4, BS5, BS6, BS7, BS8, BS10, BS11, BS12, BS13, BS16, BS17, BS18	BS33, BS38, BS42	BS57
Plectorhyncha lanceolata	Striped Honeyeater	-	-	X	X		I	BS19, BS20	
Cacatua galerita	Sulphur-crested Cockatoo	-	-	X	X	X	I	BS20, BS21, BS27, BS32, BS34	BS43, BS49, BS50, IR16
Podargus strigoides	Tawny Frogmouth	-	-	X	X		SL1, BS11	SL4	
Corvus orru	Torresian Crow	-	-	X	X	X	BS1, BS3, BS6, BS7, BS11, BS17	BS20, BS21, BS22, BS26, BS27, BS32, BS33, BS34, BS36, BS37, BS38, IR10, IR11, IR15	BS43, BS44, BS48, BS49, BS54, IR16
Daphoenositta chrysoptera	Varied Sittella	-	-		X	X		BS40, BS42	BS56

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Malurus lamberti	Variegated Fairy-wren	-	-	X			I		
Dendrocygna arcuata	Wandering Whistling Duck	M	-		X			I	
Aquila audax	Wedge-tailed Eagle	-	-	X	X		I	I	
Smicrornis brevirostris	Weebill	-	-	X	X	X	BS1, BS2, BS3, BS4, BS5 , BS7, BS12, BS13	BS19, BS20, BS29, BS36, BS37, BS38, BS39, BS42	BS43, BS44, BS45, BS55, BS57, BS58
Hirundo neoxena	Welcome Swallow	M	-	X			I		
Gerygone fusca	Western Gerygone	-	-		X			BS37, BS38	
Chlidonias hybrida	Whiskered Tern	M	-		X			BS34	
Haliastur sphenurus	Whistling Kite	M	-	X		X	BS7		BS47
Cheramoeca leucosterna	White-backed Swallow	-	-			X			BS47
Coracina papuensis	White-bellied Cuckoo-shrike	M	-	X	X		BS1	BS20, BS21, BS27	
Artamus leucorynchus	White-breasted Woodswallow	-	-	X	X		BS1	I	
Artamus superciliosus	White-browed Woodswallow	-	-		X			BS21	
Lichenostomus	White-eared	-	-	X	X	X	BS6, BS10	BS25, BS40	BS43, BS44

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
leucotis	Honeyeater								
Egretta novaehollandiae	White-faced Heron	-	-	X	X		I	I	
Melithreptus lunatus	White-naped Honeyeater	-	-			X			I
Ardea pacifica	White-necked Heron	-	-	X	X		BS11	BS34, IR11	
Lichenostomus penicillatus	White-plumed Honeyeater	-	-	X		X	BS1, BS4, BS5, BS17		BS43, BS47, BS55
Gerygone albogularis	White-throated Gerygone	-	-	X	X	X	BS1, BS2, BS8, BS11, BS13	BS19, BS20, BS23, BS25, BS26, BS28, BS30, BS33, BS39, BS40	BS45, BS57
Melithreptus albogularis	White-throated Honeyeater	-	-	X			BS12		
Corcorax melanorhamphos	White-winged Chough	-	-	X			I		
Lalage sueurii	White-winged Triller	-	-	X	X	X	I	BS20, BS22, BS42	BS46
Rhipidura leucophrys	Willie Wagtail	-	-	X	X	X	BS1, BS2, BS7, BS8, BS12, BS13, BS17, IR2	BS20, BS21, BS22, BS34, BS37, BS42	BS43, BS45, BS46, BS47, IR16

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	-	-	X	X		BS11	BS19, BS37	
Manorina flavigula	Yellow-throated Miner	-	-	X	X		BS1, BS2, BS7, BS14, BS17	BS21, BS27, BS31, BS32, BS33, BS37	
Taeniopygia guttata	Zebra Finch	-	-	X	X	X	I	BS25	BS43, IR16
Mammals									
Phascolarctos cinereus	Koala	V	SLC	X			SL2		
Trichosurus vulpecula	Common Brushtail Possum	-	-	X			EC5		
Petaurus breviceps	Sugar Glider	-	-	X			SL2		
Aepyprymnus rufescens	Rufous Bettong	-	-	X	X		SL1	SL5, IR7	
Macropus giganteus	Eastern Grey Kangaroo	-	-	X	X	X	SL1	IR10, IR11, IR13, IR15	IR16
Macropus robustus	Euro	-	-		X	X		I	IR19
Macropus rufus	Red Kangaroo	-	-	X	X	X	I	I	IR16
Wallabia bicolor	Swamp Wallaby	-	-	X	X	X	IR6	IR10, IR15	IR19
Tachyglossus aculeatus	Short-beaked Echidna	-	SLC			X			I

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Hydromys chrysogaster	Water Rat	-	-	X	X		IR2	IR15	
Saccolaimus flaviventris	Yellow-bellied Sheath-tail Bat	-	-	X	X	X	AN1, AN2, AN3, AN4, AN5, AN6, AN8, AN9, AN10, AN11	AN13, AN14, AN15, AN19, AN20	AN21, AN22, AN23
Taphozous troughtoni	Troughton's Sheath-tailed Bat	-	-	X	X	X	AN9, AN12	AN15	AN23
Mormopterus beccari	Beccaris Freetail Bat	-	-	X	X	X	AN3, AN5, AN6, AN9	AN13, AN14, AN15, AN19, AN20	AN21, AN23
Austronomus australis	White-striped Freetail-bat	-	-	X			AN2, AN4, AN5, AN8, AN12		
Chaerephon jobensis	Northern Free-tailed Bat	-	-		X	X		AN13, AN14, AN15	AN21, AN22, AN23
Chalinolobus gouldii	Gould's Wattled Bat	-	-	X	X	X	AN1, AN2, AN3, AN4, AN5, AN6, AN9, AN10	AN13, AN14, AN15, AN19, AN20	AN21, AN22, AN23
Chalinolobus morio	Chocolate Wattled Bat	-	-	X	X		AN1, AN2, AN3, AN6, AN8, AN9	AN13, AN14, AN15, AN20	
Chalinolobus picatus	Little Pied Bat	-	-	X	X		AN2, AN8, AN9	AN15, AN20	
Nyctophilus sp.	-	-	-	X	X		AN4, AN5, AN6, AN8, AN9, AN12	AN14, AN15	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
Scotorepens balstoni	Western Broad-nosed Bat	-	-	X	X	X	AN1, AN2, AN6, AN9	AN13, AN14, AN15, AN20	AN23
Scotorepens greyii	Little Broad-nosed Bat	-	-	X			AN1, AN2, AN3, AN5, AN6, AN7		
Scotorepens greyii/Scotorepens sanbori		-	-		X	X		AN13, AN14, AN15, AN20	AN21, AN22, AN23
Vespadelus baverstocki	Inland Forest Bat	-	-	X	X		AN3, AN6, AN9	AN13, AN14, AN15, AN20	
Vespadelus troughtoni	Eastern Cave Bat	-	-	X	X	X	AN1, AN2, AN3, AN5, AN6, AN7, AN9	AN13, AN14, AN15, AN20	AN21
Vespadelus vulturnus	Little Forest Bat	-	-	X			AN2, AN4, AN11, AN12		
Pteropus scapulatus	Little Red Flying-fox	-	-		X			I	
*Mus musculus**	House Mouse	-	-	X			EC4		
*Canis familiaris**	Dog/Dingo	-	-	X	X	X	I	IR7, IR10, IR12	IR16, IR19
*Felis catus**	Feral Cat	-	-	X	X	X	EC6, IR3	IR10	IR16
*Bos taurus**	European Cattle	-	-	X	X	X	IR6	IR7, IR11, IR12, IR13	IR16
*Sus scrofa**	Feral Pig	-	-	X	X		I	IR11, IR13	

Scientific Name	Common Name	Species Status[1]		Survey Timing			Survey Sites		
*Oryctolagus cuniculus**	European Rabbit	-	-	X	X		I	I	
*Equus ferus caballus**	Horse	-	-		X			I	

[1] Threatened, migratory and/or marine species status under the NC Act and/or EPBC Act (current at 6 March 2015).

V = Vulnerable, E = Endangered, NT = Near Threatened, Mi = Migratory, M = Marine, SLC = Special Least Concern (non-migratory).

[2] Excludes Special Least Concern (migratory) species.

* Denotes an introduced species.

\+ Species listed as a marine species under the EPBC Act as Great Egret (*Ardea alba*).

CUMBERLAND ECOLOGY

Table K.2 Fauna Survey Site Coordinates

Zone	Easting	Northing	Survey Type	Label
55	414959	7586063	Anabat 1	AN01
55	416675	7583717	Anabat 2	AN02
55	416152	7581208	Anabat 3	AN03
55	417053	7588098	Anabat 4	AN04
55	417493	7591229	Anabat 5	AN05
55	415681	7591804	Anabat 6	AN06
55	412211	7590304	Anabat 7	AN07
55	411581	7588655	Anabat 8	AN08
55	413807	7589742	Anabat 9	AN09
55	413131	7589334	Anabat 10	AN10
55	413055	7589297	Anabat 11	AN11
55	409823	7589450	Anabat 12	AN12
55	413071	7589339	Anabat 16	AN16
55	412269	7590463	Anabat 17	AN17
55	417134	7588040	Active Search 1	AR01
55	412223	7590303	Active Search 2	AR02
55	408161	7594792	Active Search 3	AR03
55	408579	7602452	Active Search 4	AR04
55	409681	7604773	Active Search 5	AR05
55	408061	7592032	Active Search 6	AR06
55	409702	7588290	Active Search 7	AR07
55	421000	7590427	Active Search 8	AR08
55	413606	7589198	Active Search 9	AR09
55	413131	7589319	Active Search 10	AR10
55	413714	7588857	Active Search 11	AR11
55	411567	7588729	Active Search 12	AR12
55	409860	7589544	Active Search 13	AR13
55	411942	7590798	Active Search 14	AR14
55	412238	7591025	Active Search 15	AR15
55	415606	7591751	Active Search 16	AR16
55	417105	7591270	Active Search 17	AR17
55	417889	7588770	Active Search 18	AR18
55	417154	7587570	Active Search 19	AR19
55	420940	7590225	Active Search 22	AR22
55	409672	7603965	Active Search 24	AR24

Zone	Easting	Northing	Survey Type	Label
55	409713	7590223	Active Search 25	AR25
55	407180	7606455	Active Search 29	AR29
55	407205	7599332	Active Search 30	AR30
55	410292	7604881	Active Search 31	AR31
55	407709	7602640	Active Search 32	AR32
55	408492	7602249	Active Search 33	AR33
55	416360	7592066	Active Search 34	AR34
55	417429	7591001	Active Search 35	AR35
55	410236	7597163	Active Search 36	AR36
55	410387	7594238	Active Search 37	AR37
55	415426	7588717	Active Search 38	AR38
55	415665	7587672	Active Search 39	AR39
55	414800	7583982	Active Search 40	AR40
55	417285	7583668	Active Search 41	AR41
55	417135	7580541	Active Search 42	AR42
55	418885	7580256	Active Search 43	AR43
55	413421	7591340	Active Search 47	AR47
55	409824	7589536	Active Search 48	AR48
55	420521	7591436	Active Search 49	AR49
55	420462	7591498	Active Search 50	AR50
55	420373	7591558	Active Search 51	AR51
55	419851	7591543	Active Search 52	AR52
55	419314	7588434	Active Search 53	AR53
55	421921	7584758	Active Search 54	AR54
55	421821	7583113	Active Search 55	AR55
55	417206	7591373	Bird Census 1	BS01
55	417915	7588772	Bird Census 2	BS02
55	417143	7588036	Bird Census 3	BS03
55	412223	7590322	Bird Census 4	BS04
55	411626	7592929	Bird Census 5	BS05
55	408161	7594792	Bird Census 6	BS06
55	408579	7602452	Bird Census 7	BS07
55	409684	7604701	Bird Census 8	BS08
55	408049	7592002	Bird Census 9	BS09
55	409701	7588286	Bird Census 10	BS10
55	420996	7590424	Bird Census 11	BS11

Zone	Easting	Northing	Survey Type	Label
55	413610	7589220	Bird Census 12	BS12
55	413148	7589296	Bird Census 13	BS13
55	413707	7588817	Bird Census 14	BS14
55	411599	7588699	Bird Census 15	BS15
55	409853	7589443	Bird Census 16	BS16
55	415712	7591826	Bird Census 17	BS17
55	417138	7587569	Bird Census 18	BS18
55	420962	7590230	Bird Census 22	BS22
55	409672	7603965	Bird Census 23	BS23
55	409704	7590235	Bird Census 24	BS24
55	407180	7606455	Bird Census 28	BS28
55	407203	7599327	Bird Census 29	BS29
55	410291	7604881	Bird Census 30	BS30
55	407709	7602635	Bird Census 31	BS31
55	408492	7602250	Bird Census 32	BS32
55	416360	7592066	Bird Census 33	BS33
55	417429	7591001	Bird Census 34	BS34
55	410236	7597163	Bird Census 35	BS35
55	410388	7594233	Bird Census 36	BS36
55	415425	7588717	Bird Census 37	BS37
55	415666	7587671	Bird Census 38	BS38
55	414798	7583982	Bird Census 39	BS39
55	417285	7583668	Bird Census 40	BS40
55	417135	7580542	Bird Census 41	BS41
55	418884	7580256	Bird Census 42	BS42
55	421428	7591272	Bird Census 46	BS46
55	417456	7591292	Bird Census 47	BS47
55	419352	7591700	Bird Census 48	BS48
55	408445	7602521	Bird Census 49	BS49
55	413421	7591340	Bird Census 50	BS50
55	409824	7589536	Bird Census 51	BS51
55	420521	7591436	Bird Census 52	BS52
55	420462	7591498	Bird Census 53	BS53
55	420373	7591558	Bird Census 54	BS54
55	419851	7591543	Bird Census 55	BS55
55	419314	7588434	Bird Census 56	BS56

Zone	Easting	Northing	Survey Type	Label
55	421921	7584758	Bird Census 57	BS57
55	421821	7583113	Bird Census 58	BS58
55	414987	7586064	Trap Grid 1	EC01
55	416668	7583733	Trap Grid 2	EC02
55	416175	7581201	Trap Grid 3	EC03
55	412220	7590303	Trap Grid 4	EC04
55	411579	7588680	Trap Grid 5	EC05
55	413819	7589732	Trap Grid 6	EC06
55	414907	7586062	Funnel Trap 01 (Trap Grid 1)	FT01
55	416658	7583724	Funnel Trap 02 (Trap Grid 2)	FT02
55	416184	7581211	Funnel Trap 03 (Trap Grid 3)	FT03
55	412217	7590387	Funnel Trap 04 (Trap Grid 4)	FT04
55	411554	7588737	Funnel Trap 05 (Trap Grid 5)	FT05
55	413868	7589720	Funnel Trap 06 (Trap Grid 6)	FT06
55	417120	7591300	Hair Tube Line 1	HT01
55	417919	7588773	Hair Tube Line 2	HT02
55	417155	7588029	Hair Tube Line 3	HT03
55	414948	7586072	IR Camera 1	IR01
55	416639	7583740	IR Camera 2	IR02
55	416163	7581157	IR Camera 3	IR03
55	412210	7590415	IR Camera 4	IR04
55	411572	7588656	IR Camera 5	IR05
55	413794	7589744	IR Camera 6	IR06
55	413070	7589337	IR Camera 10	IR10
55	412270	7590462	IR Camera 11	IR11
55	409339	7597086	IR Camera 19	IR19
See GIS transect			Spotlighting 01	SL01
See GIS transect			Spotlighting 02	SL02
55	415440	7591756	Trap Grid 07 (Various)	Trap Grid 7 - AN07, AR20, BS20, EC07, FT07, PT07, IR07, SL04
55	417280	7591438	Trap Grid 08 (Various)	Trap Grid 8 - AN14, AR21, BS21, EC08, FT08, PT02, IR08, SL05
55	408736	7594334	Trap Grid 09 (Various)	Trap Grid 9 - AN15, AR23, BS19, EC09,

Zone	Easting	Northing	Survey Type	Label
				FT09, PT03, IR09, SL03
55	409483	7603885	Trap Grid 10 (Various)	Trap Grid 10 - AN18, AR27, BS26, EC10, FT10, PT04, IR12, SL07
55	408401	7602406	Trap Grid 11 (Various)	Trap Grid 11 - AN19, AR28, BS27, EC11, FT11, PT05, IR13, SL08
55	409339	7597086	Trap Grid 12 (Various)	Trap Grid 12 - AN20, AR26, BS25, EC12, FT12, PT06, IR14/15, SL06
55	420555	7583299	Trap Grid 15 (Various)	Trap Grid 15 - AN23, AR46, BS45, EC15, FT15, PT09, IR18, SL11
55	420614	7586509	Trap Grid 14 (Various)	Trap Grid 14 - AN22, AR45, BS44, EC14, FT14, PT08, IR17, SL10
55	421030	7590393	Trap Grid 13 (Various)	Trap Grid 13 - AN21, AR44, BS43, EC13, FT13, PT07, IR16, SL09

Appendix L

Assessments of Significance for Threatened Fauna Species under the EPBC Act

This appendix contains formal Assessments of Significance for threatened or migratory flora and fauna species listed under the EPBC Act recorded or assessed with a high or moderate potential to occur within the study area (**Table L.1**).

The assessments have been undertaken in accordance with the Significant Impact Guidelines. The EPBC Act Significant Impact Guidelines assist in determining whether a project will have a significant impact on a MNES.

For the purposes of each species assessment below, the areas proposed for open cut mining will be progressively rehabilitated with plant species in a way that recreates habitat for woodland plants and animals in the medium (10 to 20 years) to long term (greater than 20 years). It is assumed that woodland rehabilitation of mined land will commence within the first five years of mining and that it will continue for the life of the mine.

It is also assumed that initially, the woodland rehabilitation will be immature and unsuitable for colonisation by woodland fauna. However, after 10-20 years it is predicted that rehabilitated areas will be suitable for an increasing number of woodland fauna species, including birds and bats. At the time of cessation of open cut mining activities (i.e. Project Year 30) there will be a range of ages of rehabilitated areas varying from 1 to almost 25 years of age. Twenty years after mine closure, 70 years after commencement of mining, it is assumed that the mined area will have substantial woodland regeneration, in which trees are expected to have started to form hollows.

Offsets will be acquired for the project and for the purposes of making the assessments below, it has been assumed that offsets will be established within 24 months of the commencement of the project.

For the purposes of assessing the cumulative impacts of mining on each species assessed below, it is assumed that each of the coal mines proposed or approved for the Galilee Coal Basin will have a similar committment to rehabilitate mined land and that each mine will also be required to provide offsets for threatened species. It is also assumed that the commencement and rate of mining of the other mines in the Galilee Coal Basin will be broadly similar and that offsets for these projects will commence within approximately 24 months of the current project.

Edge effects associated with mining were assessed for each species. Edge effects will occur within native vegetation where an "edge" has been created by clearing of vegetation for mining or associated purposes. It was assumed that edge effects could include environmental changes associated with increased levels of noise, dust, traffic and night-lighting. There is also potential for increased densities of exotic plants and pest animals associated with the edges of native vegetation exposed to mining.

Edge effects will not be permanent and will decline as progressive rehabilitation becomes established. Regeneration of native plant species on cleared/mined areas will eventually nullify the edge effects for native fauna. As explained above, it is assumed that 20 years after mine closure and 70 years after commencement of mining, the mined area will have substantial woodland regeneration and edge effects would have been completely removed.

Table L.1 EPBC Act Listed Threatened and Migratory Species Recorded or with the Potential to Occur within the Study Area

Scientific Name	Common Name	Status under the EPBC Act[1]	Section Reference
Birds			
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	V	L.1
Poephila cincta cincta	Black-throated Finch (white-rumped subspecies)	E	L.2
Rostratula australis	Australian Painted Snipe	E, M*, Mi*	L.3
Apus pacificus	Fork-tailed Swift	M, Mi	L.4
Ardea ibis	Cattle Egret	M, Mi	L.4
Ardea modesta	Eastern Great Egret	Mi, M+	L.4
Gallinago hardwickii	Latham's Snipe	M, Mi	L.4
Merops ornatus	Rainbow Bee-eater	M, Mi	L.4
Myiagra cyanoleuca	Satin Flycatcher	M, Mi	L.4
Plegadis falcinellus	Glossy Ibis	M, Mi	L.4
Mammals			
Phascolarctos cinereus	Koala	V	L.5

[1] Threatened, migratory and/or marine species status under the EPBC Act (current at 6 March 2015). V = Vulnerable, E = Endangered, Mi = Migratory, M = Marine

\+ Species listed as a marine species under the EPBC Act as Great Egret (*Ardea alba*).

* Species listed as Threatened under the EPBC Act as Painted Snipe (*Rostratula australis*) (sensu lato).

A brief summary on the habitat requirements and distribution of each species is provided, followed by an assessment of whether or not each species forms part of an "important population" as defined under the EPBC Act. Each significant impact criterion is shown as italicised text below for which a response has been supplied beneath in plain text.

L.1 Squatter Pigeon

The Squatter Pigeon (southern subspecies) (*Geophaps scripta scripta*) is listed as Vulnerable under the EPBC Act. It occurs in tropical, open, dry sclerophyll woodlands and savannahs of north-eastern Australia. They are most often observed in grassy understorey of Eucalyptus woodland, close to permanent water bodies. It has also been recorded in sown grasslands with scattered remnant trees, disturbed habitats (i.e. around stockyards, along roads and railways, and around settlements), in scrub and Acacia growth. The Squatter Pigeon (southern subspecies) feeds on the seeds of grasses, legumes and other herbs and forbs and sometimes eats fallen seeds from *Acacia* spp. (DotE 2014).

The Squatter Pigeon (southern subspecies) was recorded at several locations in the south and eastern parts of the study area (**Figure 14**). It was commonly observed along the tracks while the field survey personnel were driving and many records were adjacent to farm dams or ephemeral drainage lines. This species is likely to be widespread in the study area. The estimated area of high value habitat for this species within the study area is 3,440 ha (**Figure 15**).

High value habitat comprises potential breeding and foraging habitat. Areas of potential habitat in the southern part of the study area occur in lower-lying flat grassy woodland areas with a nearby ephemeral water source, while areas in the northern portion of study area mainly comprise habitat close to an ephemeral water source.

The EPBC Act Significant Impact Guidelines state that the concept of an 'important population' is central to assessing the potential for an action to have a significant impact on a Vulnerable species. According to the Significant Impact Guidelines;

'…*an important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are*:

- *key source populations either for breeding or dispersal*
- *populations that are necessary for maintaining genetic diversity, and/or*
- *populations that are near the limit of the species range.*

Each of these points is addressed below.

Key source population either for breeding or dispersal

The population of the Squatter Pigeon (southern subspecies) that occurs in and near the study area is not considered to be a key source population for breeding or dispersal. This species is known to occur in the locality and due to the widespread habitat that is available; it is locally abundant. As such, the birds that occur in the study area are not likely to be a key source population.

Populations that are near the limit of the species range

The study area is not located near the limit of the range of the Squatter Pigeon (southern subspecies). It occurs from central New South Wales to Cape York Peninsula and from the coast to as far west as Longreach.

For the reasons outlined above, the population of the Squatter Pigeon (southern subspecies) that occurs in the study area is not considered to be important for the long term survival and recovery of this species and is not considered to comprise an 'important population' as defined by the EPBC Act. Furthermore, DotE advises that '*No populations have been identified as being especially important to the long-term survival or recovery of the Squatter Pigeon'* (DotE 2014).

Populations that are necessary for maintaining genetic diversity

Due to the widespread occurrence of this species in the study area and within the surrounding locality, it is unlikely that the individuals recorded within the study area are genetically distinct. It is therefore not considered that this population is necessary for maintaining genetic diversity.

Significant Impact Criteria

An action is likely to have a significant impact on a vulnerable species 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

As the population of the Squatter Pigeon (southern subspecies) within the study area is not considered to be an important population of the species, the project will not lead to a long term decrease in the size of an important population.

Large areas of similar habitat will remain outside the study area and will continue to provide habitat for this species. The project will also involve rehabilitation of cleared areas into woodland that is representative of the existing woodland in the study area. Over time (20 -40 years), the rehabilitated areas will provide similar levels of habitat to that being removed.

In addition to rehabilitation, it is also proposed that additional permanent watering points will be created that can be used for drinking by the Squatter Pigeon (southern subspecies).

Edge effects associated with mining were assessed for each species. Edge effects will occur within native vegetation where an "edge" has been created by clearing of vegetation for mining or associated purposes. It was assumed that edge effects could include environmental changes associated with increased levels of noise, dust, traffic and night-lighting. There is also potential for increased densities of exotic plants and pest animals associated with the edges of native vegetation exposed to mining.

The project will also add to cumulative impacts on the species in the Galilee Coal Basin. It is estimated that the biggest cumulative impacts will occur within 2 to 10 years after commencement of mining, because all mines will be assumed to be in operation and any rehabilitation will be immature. It is also estimated that cumulative impacts will start to diminish after 10 years as the rehabilitated areas become more established, mines progressively rehabilitate more land, and actively manage offset lands for conservation.

Edge effects will not be permanent and will decline as progressive rehabilitation becomes established. As staged rehabilitation occurs, regeneration of native plant species will occur on cleared/mined areas and reduce and will eventually nullify the edge effects for native fauna. As explained above, it is assumed that 20 years after mine closure and 70 years after commencement of mining, the mined area will have substantial woodland regeneration and edge effects would have been completely removed.

Squatter Pigeons (southern subspecies) are often found along unmade roads and tracks and disturbed vegetation indicating that this species may not be particularly susceptible to edge effects. However, as staged rehabilitation occurs, regeneration of native plant species on cleared/mined areas will eventually nullify the edge effects for native fauna. By 20 years after mine closure and 70 years after commencement of mining, it is assumed that the mined area will have substantial woodland regeneration and edge effects would have been completely removed.

Offsets that will include habitat for the Squatter Pigeon (southern subspecies) will be established within 24 months of commencement of mining and will be permanent. The offsets will help to compensate for the cumulative impacts of mining in the Galilee Coal Basin, as will progressive rehabilitation of mined areas to support woodland.

When it is considered that unmined habitats will remain extensive in the Galilee Coal Basin, and that there will be staged rehabilitation for each approved mine, and the considerable offsets that are proposed for each mine, it is considered that the project will not result in a long-term decrease in the size of a population of the Squatter Pigeon (southern subspecies).

reduce the area of occupancy of an important population

The project will reduce the area of occupancy of this species, however as the population of the Squatter Pigeon (southern subspecies) within the study area is not considered to be an important population of the species, the project will not reduce the area of occupancy of an important population.

The majority of the study area will be rehabilitated after mining to woodland that is representative of existing woodland. Viable populations of this species will remain in the surrounding areas of similar habitat and it is expected that this species will be able to colonise the rehabilitated areas over time (within 20 to 40 years).

fragment an existing important population into two or more populations

The study area is surrounded by similar vegetation to that which will be impacted as a result of the project. However, vegetation will remain connected and habitat linkages will remain. Accordingly, the project will not fragment an existing population into two or more populations. Furthermore, the population of the Squatter Pigeon (southern subspecies) within the study area is not considered to be an important population of the species.

adversely affect habitat critical to the survival of a species

The habitat to be removed in the study area is not considered to be critical to the survival of the Squatter Pigeon (southern subspecies) as a species. That notwithstanding, the removal of approximately 1,436 ha high value habitat will impact substantially on the local occurrence of this species. However; large areas of similar habitat occur in the locality that will remain, and this species will remain viable in these areas. Furthermore, the majority of the study area will be rehabilitated after mining to woodland that is representative of existing woodland, and it is expected that this species will be able to colonise the rehabilitated areas over time.

disrupt the breeding cycle of an important population

As the population of the Squatter Pigeon (southern subspecies) within the study area is not considered to be an important population of the species, the project will not disrupt the breeding cycle of an important population. Large areas of similar habitat, including suitable breeding habitat will remain in the locality that will continue to provide habitat for this species. Furthermore, the majority of the study area will be rehabilitated after mining to woodland that is representative of existing woodland, and it is expected that this species will be able to colonise the rehabilitated areas over time.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The removal of habitat for the project will not cause the Squatter Pigeon (southern subspecies) as a species to decline. That notwithstanding, the removal of approximately 1,436 ha of high value habitat will impact substantially on the local occurrence of this species. The project will result in the removal of significant areas of breeding and foraging habitat for this species, and will result in a reduction in the area of habitat available. However; large areas of similar habitat occur in the locality that will remain, and this species will remain viable in these areas. Furthermore, mined areas will be rehabilitated to contain woodland habitats that will provide suitable habitat for this species in the long term.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

It is considered unlikely that the project will result in an invasive species becoming established in habitat for the Squatter Pigeon (southern subspecies). Feral animals already occur in the study area and these will be controlled as part of the project. It is unlikely that any other invasive plant or animal will become established as a result of the project.

introduce disease that may cause the species to decline, or

It is considered unlikely that the project will introduce a disease that may cause the Squatter Pigeon (southern subspecies) to decline.

interfere substantially with the recovery of the species.

The project will interfere to some degree with the recovery of the Squatter Pigeon (southern subspecies). The project will result in the removal of substantial areas of breeding and foraging habitat for this species, and will result in a reduction in the area of habitat available to this species. However, large areas of similar habitat occur in the locality that will remain, and this species will remain viable in these areas. Furthermore, mined areas will be rehabilitated to contain woodland habitats that will provide suitable habitat for this species in the long term.

Conclusion

Approximately 1,436 ha of high value habitat for this species is proposed to be cleared to allow for open cut mining and the construction of mine infrastructure. A further 3 ha may be

cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). This clearing has been assessed as potentially giving rise to a significant residual impact on the Squatter Pigeon (southern subspecies) (**Section 7**).

The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant residual impacts.

Biodiversity offsets will be provided to compensate for significant residual impacts on this species that are predicted to arise due to clearing for open cut mining, mine infrastructure and the construction of remedial drainage works. Offsets are described in the Biodiversity Offset Strategy.

Consistency of Action with DotE Plans

- Approved Conservation Advice

  The project is consistent with the *Commonwealth Conservation Advice on Geophaps scripta scripta (Squatter Pigeon [southern])* and this conservation advice has been considered where relevant. This advice has been used to form an understanding of the habitat requirements for the Squatter Pigeon (southern subspecies) and has enabled the mapping of habitat for this species within the project site. This advice has also been used to determine any potential threats to the species that may result from the project. In addition, the advice provides background information on this species, which has informed the EPBC Act assessment of significance under the Significant Impact Guidelines.

- Recovery Plan

  There is no recovery plan available for the Squatter Pigeon (southern subspecies), and the DotE Species Profile and Threats Database notes that no recovery plan is required.

- Threat Abatement Plans

  There are threat abatement plans in place that are applicable to the Squatter Pigeon (southern subspecies) regarding the threat of Tramp Ants, Rabbits, Feral Cats and the European Red Fox. There are no project activities that would increase these threats to the Squatter Pigeon (southern subspecies), or any other fauna species on the project site. Furthermore, the project will have a Feral Animal and Weed Management plan in place which will further reduce these threats on the Squatter Pigeon (southern subspecies). Waste management measures will also be implemented for the project which will ensure that vermin and feral species are not attracted to the project site. The project is not expected to increase any key threatening processes that may impact this species.

L.2 Black-throated Finch

The Black-throated Finch (white-rumped subspecies) (*Poephila cincta cincta*) is listed as Endangered under the EPBC Act. This species has been recorded from several locations in the southern central portion of the study area (**Figure 14**). The Black-throated Finch (white-rumped subspecies) occurs mainly in grassy, open woodlands and forests, typically dominated by *Eucalyptus*, *Corymbia* and *Melaleuca* species, and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water (DotE 2014). It is dependent on grassy woodland with access to water for regular drinking during the day. It is a sedentary bird, rather than nomadic or migratory, so it requires large areas with a mosaic of different habitats supporting a diversity of seeding grasses to provide feed resources throughout the year, including the wet season (DotE 2014).

No reliable information is available on the existence, number, or size of subpopulations of the Black-throated Finch (white-rumped subspecies). The subspecies is thought to occur as a single, contiguous population, but this estimate is considered to be of low reliability, due to uncertainty about the number of subpopulations and/or the extent of genetic separation (DotE 2014).

The Black-throated Finch (white-rumped subspecies) was recorded from several locations in the southern portion of the study area (**Figure 14**). A flock of approximately 12 individuals was recorded several times during the first survey period (presumably the same flock) and several individuals and some small flocks were recorded at separate locations during the second and third round of field surveys. It is considered be moderately common in the southern portion of the study area.

Habitat modelling has been conducted for this species based on information in the Recovery Plan, site specific information and data from survey conducted adjacent to the study area (**Appendix G**). Habitat modelling indicates that approximately 4,433.7 ha of high value habitat for this species is present in the study area (**Figure 17**). In general, with the exception of the sandstone escarpments to the north-west of the study area, the majority of the study area is likely to provide suitable habitat for this species, with areas of potential high value habitat mapped as areas that contain a water source and where records of this species have been located.

Significant Impact Criteria

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 species is thought to occur as a single, contiguous population that extends into habitat surrounding the study area. These areas will remain viable and will continue to support this species in the long term.

A decrease in the size of this population will occur, as approximately 4,433.7 ha of high value habitat will be removed for the project. However, the project will involve the rehabilitation of the clearance footprint into woodland that is representative of the existing woodland in the study area. It is also proposed that additional permanent watering points will be created that can be used for drinking by the finch. Over time (20-40 years), the rehabilitated areas will provide similar levels of habitat to that being removed.

Edge effects associated with mining were assessed for each species. Edge effects will occur within native vegetation where an "edge" has been created by clearing of vegetation for mining or associated purposes. It was assumed that edge effects could include environmental changes associated with increased levels of noise, dust, traffic and night-lighting. There is also potential for increased densities of exotic plants and pest animals associated with the edges of native vegetation exposed to mining.

The project will also add to cumulative impacts on the species in the Galilee Coal Basin. It is estimated that the biggest cumulative impacts will occur within 2 to 10 years after commencement of mining, because all mines will be assumed to be in operation and any rehabilitation will be immature. It is also estimated that cumulative impacts will start to diminish after 10 years as the rehabilitated areas become more established, mines progressively rehabilitate more land, and actively manage offset lands for conservation.

Edge effects will not be permanent and will decline as progressive rehabilitation becomes established. As staged rehabilitation occurs, regeneration of native plant species on cleared/mined areas will eventually nullify the edge effects for native fauna. As explained above, it is assumed that 20 years after mine closure and 70 years after commencement of mining, the mined area will have substantial woodland regeneration and edge effects would have been completely removed.

Offsets for the Black-throated Finch will be established within 24 months of commencement of mining and will be permanent. The offsets will help to compensate for the cumulative impacts of mining in the Galilee Coal Basin, as will progressive rehabilitation of mined areas to support woodland.

When it is considered that unmined habitats will remain extensive in the Galilee Coal Basin, and that there will be staged rehabilitation for each approved mine, and the considerable offsets that are proposed for each mine, it is considered that the project will not result in a long-term decrease in the size of a population of the Black-throated Finch (white-rumped subspecies).

reduce the area of occupancy of the species

The project will reduce the area of occupancy of this species, as approximately 4,433.7 ha of high value habitat will be removed. However, the majority of the study area will be rehabilitated after mining to woodland that is representative of existing woodland. Viable populations of this species will remain in the surrounding areas of similar habitat and it is expected that this species will be able to colonise the rehabilitated areas over time (within 20 to 40 years). In the long term, the area of occupancy of this species will not be significantly reduced.

fragment an existing population into two or more populations

The study area is surrounded by similar vegetation and habitat to that which will be removed. As such, connectivity to surrounding areas of habitat will not be lost. The Black-throated Finch (white-rumped subspecies) is a highly mobile species and is expected to be able to move in response to resource availability and to access separated habitats. Accordingly, connectivity will remain and it is not considered likely that the project will fragment an existing population into two or more populations.

adversely affect habitat critical to the survival of a species

The habitat provided by the study area is not considered to be critical for the survival of the Black-throated Finch (white-rumped subspecies). Large areas of similar habitat occur outside the study area that will remain, and it is considered likely that this species will persist in these areas.

disrupt the breeding cycle of a population

The project may remove potential breeding habitat for the Black-throated Finch (white-rumped subspecies), but it is not expected to disrupt the breeding cycle of the overall population. Breeding habitat will remain in nearby areas of similar vegetation that can be utilised by this species. Furthermore, the majority of the study area will be rehabilitated after mining to woodland that is representative of existing woodland, and it is expected that this species will be able to colonise the rehabilitated areas over time.

modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Although the project will remove habitat for this species, it is not expected to result in a decline in the species. Large areas of similar habitat occur outside the study area that will remain, and it is considered that this species will persist in these areas. Furthermore, the majority of the study area will be rehabilitated after mining to woodland that is representative of existing woodland, and it is expected that this species will be able to colonise the rehabilitated areas over time.

result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

It is considered unlikely that the project will result in an invasive species becoming established in habitat for the Black-throated Finch (white-rumped subspecies). Feral animals already occur in the study area and these will be controlled as part of the project. It is unlikely that any other invasive plant or animal will become established as a result of the project.

introduce disease that may cause the species to decline, or

It is considered unlikely that the project will introduce a disease that may cause the Black-throated Finch (white-rumped subspecies) to decline.

interfere with the recovery of the species.

The project will not interfere with the recovery of the Black-throated Finch (white-rumped subspecies). Large areas of similar habitat occur in the locality that will remain, and this species will remain viable in these areas. Furthermore, mined areas will be rehabilitated to contain woodland habitats that will provide suitable habitat for this species in the long term.

Conclusion

Approximately 4,433.7 ha of high value habitat for this species is proposed to be cleared to allow for open cut mining and the construction of mine infrastructure. A further 9 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). This clearing has been assessed as potentially giving rise to a significant, residual impact on the Black-throated Finch (white-rumped subspecies) (**Section 7**).

The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant, residual impacts.

Biodiversity offsets will be provided to compensate for significant residual impacts on this species that are predicted to arise due to clearing for open cut mining, mine infrastructure and the construction of remedial drainage works. Offsets are described in the Biodiversity Offset Strategy.

Consistency of Action with DotE Plans

- Approved Conservation Advice

  The project is consistent with the *Commonwealth Conservation Advice on Southern Black-throated Finch (Poephila cincta cincta)* and this conservation advice has been considered where relevant. This advice has been used to form an understanding of the habitat requirements for the Black-throated Finch (white-rumped subspecies) and has enabled the mapping of habitat for this species within the project site. This advice has also been used to determine any potential threats to the species that may result from the project. In addition, the advice provides background information on this species, which has informed the EPBC Act assessment of significance under the Significant Impact Guidelines.

- Recovery Plan

  The *National Recovery Plan for the Black-throated Finch southern subspecies Poephila cincta cincta* has been considered in detail. This recovery plan was used extensively in modelling habitat for this species within the project site based on suitable regional ecosystems that have been mapped within the project site. This recovery plan was also used in modelling potential habitat for this species in the region.

- Threat Abatement Plans

There is one threat abatement plan in place that is applicable to the Black-throated Finch (white-rumped subspecies) regarding the threat of Rabbits. There are no project activities that would increase these threats to the Black-throated Finch (white-rumped subspecies), or any other fauna species on the project site. Furthermore, the project will have a Feral Animal and Weed Management plan in place which will further reduce these threats on the Black-throated Finch (white-rumped subspecies). Waste management measures will also be implemented for the project which will ensure that vermin and feral species are not attracted to the project site. The project is not expected to increase any key threatening processes that may impact this species.

L.3 Australian Painted Snipe

The Australian Painted Snipe is listed as Endangered under the EPBC Act. Although not recorded during the field survey, it has moderate potential to occur based on the presence of suitable habitat. There are limited areas of habitat present in the study area that are suitable for this species, however approximately 135.2 ha of seasonal wetland habitat, comprising the northern and southern seasonal wetlands in the study area, is likely to provide both foraging and breeding habitat for this species when they contain water (**Figure 19**). The southern seasonal wetland, comprising 12 ha of habitat for this species, will be removed for the proposed open cut mining area and mine infrastructure (**Figure 29**). The northern seasonal wetland occurs in an area that will be subsided, however mitigation measures will ensure that existing drainage will be maintained in these areas and that the northern seasonal wetland will remain.

Significant Impact Criteria

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

The project will not lead to a long term decrease in the size of a population of the Australian Painted Snipe. This species was not recorded from the study area and only two small areas of seasonal wetland are present; the majority of which will be retained. Large areas of similar habitat will remain in nearby Lake Buchanan and Lake Galilee.

The project will also involve the provision of fauna watering points which will include creating areas of aquatic habitat by excavating pools to provide a deeper reservoir of water. Such watering points will be fenced to prevent access by cattle. Areas of aquatic habitat will be designed to have:

- A deep section that provides a suitable reservoir of water that will persist into the dry season;
- A large, shallow area that is inundated during the wet season;

- Presence of a diversity of fringing vegetation such as sedges, rushes and reeds; and
- Canopy tree species nearby.

The creation of aquatic habitat will benefit the Australian Painted Snipe as this species generally inhabits aquatic habitats containing temporary or permanent wetlands.

The project will also involve rehabilitation of cleared areas into woodland that is representative of the existing woodland in the study area. Over time (20-40 years), the rehabilitated areas will provide similar levels of habitat to that being removed.

Edge effects associated with mining were assessed for each species. Edge effects will occur within native vegetation where an "edge" has been created by clearing of vegetation for mining or associated purposes. It was assumed that edge effects could include environmental changes associated with increased levels of noise, dust, traffic and night-lighting. There is also potential for increased densities of exotic plants and pest animals associated with the edges of native vegetation exposed to mining.

The project will also add to cumulative impacts on the species in the Galilee Coal Basin. It is estimated that the biggest cumulative impacts will occur within 2 to 10 years after commencement of mining, because all mines will be assumed to be in operation and any rehabilitation will be immature. It is also estimated that cumulative impacts will start to diminish after 10 years as the rehabilitated areas become more established, mines progressively rehabilitate more land, and actively manage offset lands for conservation.

Edge effects will not be permanent and will decline as progressive rehabilitation becomes established. As staged rehabilitation occurs, regeneration of native plant species on cleared/mined areas will eventually nullify the edge effects for native fauna. As explained above, it is assumed that 20 years after mine closure and 70 years after commencement of mining, the mined area will have substantial woodland regeneration and edge effects would have been completely removed.

Offsets that will include some habitat for the Australian Painted Snipe will be established within 24 months of commencement of mining and will be permanent. The offsets will help to compensate for the cumulative impacts of mining in the Galilee Coal Basin, as will progressive rehabilitation of mined areas to support woodland.

When it is considered that unmined habitats will remain extensive in the Galilee Coal Basin, and that there will be staged rehabilitation for each approved mine, and the considerable offsets that are proposed for each mine, it is considered that the project will not result in a long-term decrease in the size of a population of the Australian Painted Snipe.

reduce the area of occupancy of the species

The project will not reduce the area of occupancy of the Australian Painted Snipe. Only two small areas of seasonal wetland are present in the study area; the majority of which will be retained. Large areas of similar habitat will remain in nearby Lake Buchanan. In addition,

the project will also involve the provision of fauna watering points which will include creating areas of aquatic habitat by excavating pools to provide a deeper reservoir of water. The creation of aquatic habitat will benefit the Australian Painted Snipe as this species generally inhabits aquatic habitats containing temporary or permanent wetlands.

The project will also involve the rehabilitation of cleared areas into habitat and over time (20-40 years), the rehabilitated areas will provide similar levels of habitat to that being removed.

fragment an existing important population into two or more populations

The project will not fragment an existing population into two or more populations. Only two small areas of seasonal wetland are present in the study area and no fragmentation of habitat will occur. This is a highly mobile species that utilises a variety of spatially separate habitats and is capable of flying over non-habitat areas in order to access suitable habitat. The majority of seasonal wetland habitat will be retained in the study area and large areas of much higher quality wetland habitat will remain in nearby Lake Buchanan.

adversely affect habitat critical to the survival of a species

The habitat to be removed in the study area is not considered to be critical to the survival of the Australian Painted Snipe. The majority of the potential habitat that exists for this species in the study area will remain. Large areas of much higher quality wetland habitat also occur in the locality (e.g. Lake Buchanan) that will remain.

disrupt the breeding cycle of a population

The project will not disrupt the breeding cycle of a population of the Australian Painted Snipe. Only small areas of seasonal wetland are present in the study area; the majority of which will be retained. The two seasonal wetlands are not considered to be suitable for breeding. Large areas of much higher quality wetland habitat will remain in nearby Lake Buchanan which are likely to be suitable for breeding.

modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Australian Painted Snipe is unlikely to decline as a result of habitat removal for the project. The majority of the potential habitat that exists for this species in the study area will remain. Large areas of much higher quality and more permanent wetland habitat also occur in the locality (i.e. Lake Buchanan).

result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

It is considered unlikely that the project will result in an invasive species becoming established in habitat for the Australian Painted Snipe. Significant numbers of feral animals already occur in the study area and these will be controlled as part of the project. It is

unlikely that any other invasive plant or animal will become established as a result of the project.

introduce disease that may cause the species to decline, or

It is considered unlikely that the project will introduce a disease that may cause the Australian Painted Snipe to decline.

interfere with the recovery of the species.

The project will not interfere with the recovery of the Australian Painted Snipe. The majority of the potential habitat that exists for this species in the study area will remain. Large areas of much higher quality wetland habitat also occur in the locality that will remain, and this species will remain viable in these areas.

Conclusion

The project would remove approximately 12 ha of potential high value habitat for this species and a further 3 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant, residual impacts.

This has not been assessed as being a significant residual impact on the Australian Painted Snipe (**Section 7**). This species has not been recorded from the study area and it is unlikely that large numbers of this species would utilise habitats in the study area. Large areas of much higher quality and more permanent wetland habitat also occur in the locality (i.e. Lake Buchannan). A minor area of habitat for the Australian Painted Snipe will be removed and no significant impact is predicted to occur as a result of the project.

Consistency of Action with DotE Plans

- Approved Conservation Advice

  The project is consistent with the *Commonwealth Conservation Advice on Rostratula australis (Australian Painted Snipe)* and this conservation advice has been considered where relevant. This advice has been used to form an understanding of the habitat requirements for the Australian Painted Snipe and has enabled the mapping of habitat for this species within the project site. This advice has also been used to determine any potential threats to the species that may result from the project. In addition, the advice provides background information on this species, which has informed the EPBC Act assessment of significance under the Significant Impact Guidelines.

- Recovery Plan

  There is no recovery plan available for the Australian Painted Snipe, however the DotE Species Profile and Threats Database acknowledges that a recovery plan is

required. As concluded in the EPBC Act assessment of significance for this species, the project is not predicted to interfere with the recovery of this species.

- Threat Abatement Plans

  There are no threat abatement plans in place for the Australian Painted Snipe.

L.4 Migratory Species

Three bird species listed as migratory and/or marine under the EPBC Act have been recorded in the study area:

- Eastern Great Egret (*Ardea modesta*);
- Rainbow Bee-eater (*Merops ornatus*); and
- Satin Flycatcher (*Myiagra cyanoleuca*).

In addition, four other species listed as migratory and/or marine under the EPBC Act are considered to have potential to occur in the study area due to the presence of suitable habitat. These include the:

- Painted Snipe (*Rostratula benghalensis*);
- Fork-tailed Swift (*Apus pacificus*);
- Cattle Egret (*Ardea ibis*); and
- Latham's Snipe (*Gallinago hardwickii*).

The Painted Snipe is also listed as a threatened species under the EPBC Act and is considered in **Section L.3**.

The remaining species are not listed as threatened species and they are considered to be relatively abundant. Potential habitat occurs in the study area for these species, and they may utilise habitats present from time to time.

Significant Impact Criteria

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

> *Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species*

Considering the nature of the habitat within the study area, it is not considered to be important habitat for migratory species.

Limited areas of habitat (135.2 ha, of which approximately 12 ha would be cleared as result of the project) are present in the study area for the wetland-dependent species, namely the: Eastern Great Egret and Latham's Snipe. Although the seasonal wetlands within the study area (**Figure 10**) may contain large remnant pools during the wet season and early dry season, they are not wetlands as such and are unreliable water sources that are unlikely to provide important habitat for these species as they dry out in summer. In addition, while the Cattle Egret is generally associated with wetlands, this species can also utilise woodland habitats and as such the majority of the study area provides suitable habitat for this species.

The Fork-tailed Swift is entirely aerial and may potentially forage over the study area. It is considered unlikely that the project would isolate an area of important habitat for this species due to a lack of records of this species in the locality and the extent of suitable habitat present in the surrounds.

The remaining two woodland-dependent species, namely the Rainbow Bee-eater and Satin Flycatcher, depend on woodland habitat to forage in or over. The project would not isolate an area of important habitat for these species due to similar, suitable woodland habitat that is present within the locality.

The project will involve the rehabilitation of cleared areas into woodland that is representative of the existing woodland in the study area. Over time (20-40 years), the rehabilitated areas will provide similar levels of habitat to that being removed.

It is also proposed that additional permanent watering points will be created that can be used for drinking by the migratory species. The project will also involve the provision of fauna watering points which will include creating areas of aquatic habitat by excavating pools to provide a deeper reservoir of water. Such watering points will be fenced to prevent access by cattle. Areas of aquatic habitat will be designed to have:

- A deep section that provides a suitable reservoir of water that will persist into the dry season;
- A large, shallow area that is inundated during the wet season;
- Presence of a diversity of fringing vegetation such as sedges, rushes and reeds; and
- Canopy tree species nearby.

The creation of aquatic habitat will benefit the Eastern Great Egret, Latham's Snipe and Cattle Egret as these species generally inhabit aquatic habitats containing temporary or permanent wetlands.

Edge effects associated with mining were assessed for each species. Edge effects will occur within native vegetation where an "edge" has been created by clearing of vegetation for mining or associated purposes. It was assumed that edge effects could include environmental changes associated with increased levels of noise, dust, traffic and night-

lighting. There is also potential for increased densities of exotic plants and pest animals associated with the edges of native vegetation exposed to mining.

The project will also add to cumulative impacts on the species in the Galilee Coal Basin. It is estimated that the biggest cumulative impacts will occur within 2 to 10 years after commencement of mining, because all mines will be assumed to be in operation and any rehabilitation will be immature. It is also estimated that cumulative impacts will start to diminish after 10 years as the rehabilitated areas become more established, mines progressively rehabilitate more land, and actively manage offset lands for conservation.

Edge effects will not be permanent and will decline as progressive rehabilitation becomes established. As staged rehabilitation occurs, regeneration of native plant species on cleared/mined areas will eventually nullify the edge effects for native fauna. As explained above, it is assumed that 20 years after mine closure and 70 years after commencement of mining, the mined area will have substantial woodland regeneration and edge effects would have been completely removed.

When it is considered that unmined habitats will remain extensive in the Galilee Coal Basin, and that there will be staged rehabilitation for each approved mine, and the considerable offsets that are proposed for each mine, it is considered that the project will not result in a long-term decrease in the size of a population of the Eastern Great Egret, Latham's Snipe, Cattle Egret, Fork-tailed Swift, Rainbow Bee-eater and Satin Flycatcher.

> *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*

As outlined above, the study area is not considered to comprise important habitat for any migratory species. That notwithstanding, the project is unlikely to result in an invasive species becoming established. A Feral Animal and Weed Management Plan will be prepared and implemented for the project that will minimise these risks.

> *Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.*

There is no evidence to suggest that the study area supports an ecologically significant proportion of the population of any of these migratory species. Accordingly, the project is considered unlikely to disrupt an ecologically significant proportion of the population of any of these migratory species.

Conclusion

The project would remove approximately 10,998 ha of potential habitat for the Fork-tailed Swift, Cattle Egret, Rainbow Bee-eater and Satin Flycatcher and a further 12 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed), while the project would remove approximately 12 ha of potential habitat for the Eastern Great Egret and Latham's Snipe and a further 3 ha may be cleared for the construction of remedial drainage

works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed).

The subsidence crack rehabilitation program will also give rise to disturbance of habitat for these species. However, this disturbance will be small scale and temporary and would not give rise to significant, residual impacts.

The project has not been assessed as having a significant residual impact on the above-listed migratory species as the study area is not considered to comprise important habitat for these species and there is no evidence to suggest that the study area supports an ecologically significant proportion of the population of these species and no breeding for any of these species was observed during field surveys (**Section 7**).

Consistency of Action with DotE Plans

- Approved Conservation Advice

  There is no approved conservation advice in place for these migratory fauna species.

- Recovery Plan

  There are no recovery plans available for these migratory fauna species.

- Threat Abatement Plans

  There is one threat abatement plan in place that is applicable to the Rainbow Bee-eater and Latham's Snipe regarding the threat of the European Red Fox and one threat abatement plan in place that is applicable to the Cattle Egret regarding the threat of feral cats. There are no project activities that would increase these threats to the Rainbow Bee-eater, Latham's Snipe or Cattle Egret, or any other fauna species on the project site. Furthermore, the project will have a Feral Animal and Weed Management plan in place which will further reduce these threats on the Rainbow Bee-eater, Latham's Snipe and Cattle Egret. Waste management measures will also be implemented for the project which will ensure that vermin and feral species are not attracted to the project site. The project is not expected to increase any key threatening processes that may impact this species.

L.5 Koala

The Koala (*Phascolarctos cinereus*) is listed as Vulnerable under the EPBC Act. One individual was recorded from the study area (**Figure 14**).

Koalas occur in sub-humid woodlands in southern and central Queensland, and in some Eucalyptus woodlands along watercourses in the semiarid environments of the western part of Queensland (DotE 2014). The Koala is known to occur in the Desert Uplands Bioregion, where the study area is located. Koalas forage on the leaves of a wide range of *Eucalyptus* spp., however they have distinct preferences for some species over others that vary across

their range. High value habitat comprising primary food trees for Koalas is likely to occur along riparian corridors in lower lying areas of the study area that support River Red Gums (*Eucalyptus camaldulensis*) or Forest Red Gum (*E. tereticornis*). Secondary food trees may occur in a number of other areas (e.g. Narrow-leaved Ironbark [*E. crebra*]).

In order to determine whether the population of Koalas in the study area comprise an 'important population' as defined under the EPBC Act, the EPBC Act Significant Impact Guidelines have been consulted. According to the EPBC Act Significant Impact Guidelines *…'an important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are*:

- *key source populations either for breeding or dispersal*
- *populations that are necessary for maintaining genetic diversity, and/or*
- *populations that are near the limit of the species range.*

Each of these points is addressed below.

Key source population either for breeding or dispersal

The population of the Koala that occurs in and near the study area is not considered to be a key source population for breeding or dispersal. This species is likely to occur sparsely throughout the locality due to the widespread habitat that is available. As such the animals that occur in the study area are not likely to be a key source population.

Populations that are necessary for maintaining genetic diversity

Due to the widespread occurrence of suitable habitat for this species in the study area and in the surrounding locality, it is unlikely that the Koalas in the study area are genetically distinct. It is therefore not considered that this population is necessary for maintaining genetic diversity.

Populations that are near the limit of the species range

The study area is not located near the limit of the range of the Koala. It is widespread in coastal and inland areas from north-east Queensland to Eyre Peninsula in South Australia. The range extends to about one million square kilometres (DotE 2014).

For the reasons outlined above, the Koala record that was located in the study area is not considered to be an important population or critical for the long term survival and recovery of this species.

Significant Impact Criteria

An action is likely to have a significant impact on a vulnerable species 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

As the record of the Koala within the study area is not considered to be an important population of the species, the project will not lead to a long term decrease in the size of an important population. Large areas of similar habitat will remain outside the study area that will continue to provide habitat for this species.

In addition, the mine will be rehabilitated to woodland after cessation of mining, thereby replacing habitat in the landscape. The project will also involve the rehabilitation of cleared areas into woodland that is representative of the existing woodland in the study area. Over time (20-40 years), the rehabilitated areas will provide similar levels of habitat to that being removed.

Edge effects associated with mining were assessed for each species. Edge effects will occur within native vegetation where an "edge" has been created by clearing of vegetation for mining or associated purposes. It was assumed that edge effects could include environmental changes associated with increased levels of noise, dust, traffic and night-lighting. There is also potential for increased densities of exotic plants and pest animals associated with the edges of native vegetation exposed to mining.

The project will also add to cumulative impacts on the species in the Galilee Coal Basin. It is estimated that the biggest cumulative impacts will occur within 2 to 10 years after commencement of mining, because all mines will be assumed to be in operation and any rehabilitation will be immature. It is also estimated that cumulative impacts will start to diminish after 10 years as the rehabilitated areas become more established, mines progressively rehabilitate more land, and actively manage offset lands for conservation.

Edge effects will not be permanent and will decline as progressive rehabilitation becomes established. As staged rehabilitation occurs, regeneration of native plant species on cleared/mined areas will eventually nullify the edge effects for native fauna. As explained above, it is assumed that 20 years after mine closure and 70 years after commencement of mining, the mined area will have substantial woodland regeneration and edge effects would have been completely removed.

Offsets that will include habitat for the Koala will be established within 24 months of commencement of mining and will be permanent. The offsets will help to compensate for the cumulative impacts of mining in the Galilee Coal Basin, as will progressive rehabilitation of mined areas to support woodland.

When it is considered that unmined habitats will remain extensive in the Galilee Coal Basin, and that there will be staged rehabilitation for each approved mine, and the considerable offsets that are proposed for each mine, it is considered that the project will not result in a long-term decrease in the size of a population of the Koala.

reduce the area of occupancy of an important population

As the record of the Koala within the study area is not considered to be an important population of the species, the project will not reduce the area of occupancy of an important

population. Large areas of similar habitat will remain outside the study area that will continue to provide habitat for this species. Potential habitat for this species is also abundant in the surrounding region (**Figure 22**). In addition, the mine will be rehabilitated to woodland after cessation of mining, thereby replacing habitat in the landscape.

The majority of the study area will be rehabilitated after mining to woodland that is representative of existing woodland. Viable populations of this species will remain in the surrounding areas of similar habitat and it is expected that this species will be able to colonise the rehabilitated areas over time (within 20 to 40 years).

fragment an existing important population into two or more populations

The study area is surrounded by similar vegetation to that which will be impacted as a result of the project. Potential habitat for this species is also abundant in the surrounding region (**Figure 22**). Vegetation will remain connected and habitat linkages will remain. Accordingly, the project will not fragment an existing population into two or more populations. Furthermore, the population of the Koala within the study area is not considered to be an important population of the species.

adversely affect habitat critical to the survival of a species

According to the EPBC Act Koala Referral Guidelines (2014i), the study area contains critical habitat for the Koala. More refined habitat mapping (**Appendix G**) conducted for this project indicates that approximately 3,246 ha of high value habitat will be removed (**Figure 21**). Accordingly, it can be considered that the project will adversely affect habitat critical to the survival of the Koala.

disrupt the breeding cycle of an important population

As the record of the Koala within the study area is not considered to be part of an important population of the species, the project will not disrupt the breeding cycle of an important population. Large areas of similar habitat including breeding habitat will remain outside the study area that will continue to provide habitat for this species. In addition, the mine will be rehabilitated to woodland after cessation of mining, thereby replacing habitat in the landscape.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Koala as a species is unlikely to decline as a result of habitat removal for the project; however the local population will be adversely affected by the removal of 3,246 ha of high value habitat. Large areas of similar habitat occur in the locality that will remain however, and this species will remain viable in these areas. Furthermore, mined areas will be rehabilitated to contain woodland habitats that will provide suitable habitat for this species in the long term.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

It is considered unlikely that the project will result in an invasive species becoming established in habitat for the Koala. Feral animals already occur in the study area and these will be controlled as part of the project. It is unlikely that any other invasive plant or animal will become established as a result of the project.

introduce disease that may cause the species to decline, or

It is considered unlikely that the project will introduce a novel disease that may cause the Koala to decline. Chlamydia is well established in Queensland Koala populations and it is unlikely that the project will exacerbate the effect of this disease.

interfere substantially with the recovery of the species.

The project will not interfere substantially with the recovery of the Koala; however it will impact on the local population through the removal of approximately 3,246 ha of high value habitat. That notwithstanding, large areas of similar habitat occur in the locality that will remain, and this species will remain viable in these areas. Furthermore, mined areas will be rehabilitated to contain woodland habitats that will provide suitable habitat for this species in the long term.

Conclusion

Approximately 3,246 ha of high value habitat for this species is proposed to be cleared to allow for open cut mining and the construction of mine infrastructure. A further 0.4 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). This clearing has been assessed as potentially giving rise to a significant, residual impact on the Koala (**Section 7**).

The subsidence crack rehabilitation program will also give rise to disturbance of habitat for this species. However, this disturbance will be small scale and temporary and would not give rise to significant residual impacts.

Consistency of Action with DotE Plans

- Approved Conservation Advice

  The project is consistent with the *Commonwealth Conservation Advice on Phascolarctos cinereus (combined population in Queensland, New South Wales and the Australian Capital Territory)* and this conservation advice has been considered where relevant. This advice has been used to form an understanding of the habitat requirements for the Koala and has enabled the mapping of habitat for this species within the project site. This advice has also been used to determine any potential threats to the species that may result from the project. In addition, the advice provides background information on this species, which has informed the EPBC Act assessment of significance under the Significant Impact Guidelines.

- Recovery Plan

There is no recovery plan available for the Koala, however the DotE Species Profile and Threats Database acknowledges that a recovery plan is required. As concluded in the EPBC Act assessment of significance for this species, the project is not predicted to interfere with the recovery of this species.

- Threat Abatement Plans

  There are no threat abatement plans in place for the Koala.

Appendix M

Significance Residual Impact Assessment for the Short-beaked Echidna

This appendix contains a formal assessment of the Short-beaked Echidna under the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (EHP, 2014d). This guideline assists in determining whether a project will have a significant impact on a MSES.

A brief summary on the habitat requirements and distribution of the Short-beaked Echidna is provided, followed by an assessment using the significant residual impact criteria (each significant impact criterion is shown as italicised text below for which a response has been supplied beneath in plain text) and then a conclusion.

Habitat Requirements and Distribution

The Short-beaked Echidna can inhabit the majority of habitat types that contain a good supply of food. They inhabit a wide range of terrestrial habitats wherever there are enough ants or termites including: deserts, the rainforest, open forest, bushland, farmland and suburban backyards. In Australia, they are most common in forested areas with abundant, termite-filled, fallen logs (Wildlife Preservation Society of Queensland, 2013).

The Short-beaked Echidna was recorded opportunistically in one location within *Eucalyptus*-dominated woodland in the southern portion of the study area during the October 2013 survey (**Figure 14**). Evidence (i.e. characteristic diggings and scats) of this species were recorded at five locations within the proposed Carmichael Coal Mine site.

Significant Residual Impact Criteria

An action is likely to have a significant impact on a special least concern (non-migratory) animal wildlife habitat if it is likely that it will result in:

a long-term decrease in the size of a local population; or

This species is considered to occur as a single, contiguous population that extends into habitat surrounding the study area. These areas will remain viable and will continue to support this species in the long term.

A decrease in the habitat available to the local population will occur, as approximately 10,880 ha of high value habitat will be removed for the project. However, the project will involve the rehabilitation of the clearance footprint into woodland that is representative of the existing woodland in the study area. Over time, these areas will provide similar levels of habitat to that being removed. Accordingly, it is considered that the project will not result in a long-term decrease in the size of a population of the Short-beaked Echidna.

a reduced extent of occurrence of the species; or

The project will reduce the area of available habitat to this species, as approximately 10,880 ha of high value habitat will be removed. However, extensive areas of similar habitat will remain and the majority of the study area will be rehabilitated after mining to woodland that is representative of existing woodland. Viable populations of this species will remain in the surrounding areas of similar habitat and it is expected that this species will be able to

colonise the rehabilitated areas over time. In the long term, the area of occupancy of this species will not be significantly reduced.

fragmentation of an existing population; or

The study area is surrounded by similar vegetation and habitat to that which will be removed. As such, connectivity to surrounding areas of habitat will not be lost. The Short-beaked Echidna is expected to be able to move in response to resource availability and to access separated habitats. Accordingly, connectivity will remain and it is not considered likely that the project will fragment an existing population.

result in genetically distinct populations forming as a result of habitat isolation; or

This species is considered to occur as a single, contiguous population that extends into habitat surrounding the study area. The Short-beaked Echidna is expected to be able to move in response to resource availability and to access separated habitats. Accordingly, connectivity will remain and it is not considered likely that the project will fragment an existing population resulting in genetically distinct populations forming.

disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.

The study area is not considered to form a significant location for breeding, feeding or nesting for the Short-beaked Echidna. This species has broad habitat requirements and similar habitat for this species is widespread around the study area. As such, it is considered that the project will not result in the disruption to ecologically significant locations (breeding, feeding or nesting sites) of this species.

Conclusion

The project would remove approximately 10,880 ha of high value habitat for this species and a further 12 ha may be cleared for the construction of remedial drainage works in subsided areas (although it is noted that the exact location and design of drains is still to be confirmed). The subsidence crack rehabilitation program will also give rise to disturbance of 24 ha of habitat for this species.

This has not been assessed as being a significant residual impact on the Short-beaked Echidna (**Section 7**). This species has broad habitat requirements and extensive areas of similar habitat occurs outside of the study area that is suitable for foraging and breeding. Additionally, the project will involve the rehabilitation of the clearance footprint into woodland that is representative of the existing woodland in the study area. Over time, these areas will provide similar levels of habitat to that being removed.

Appendix N

Tension Crack Rehabilitation

CUMBERLAND ECOLOGY

N.1 Methodology for Calculating Vegetation Disturbance

Figure 32 shows the project longwall layout in relation to vegetation. The area of vegetation predicted to be disturbed by surface subsidence cracking and the rehabilitation of cracks was calculated using the following method:

1. The length of remnant vegetation along the perimeter of each longwall panel was calculated (**Figure 32**). The perimeter of the longwall panel is under tensile strain following subsidence and is an area where surface subsidence cracking could potentially occur.

2. The length of vegetation calculated in Step 1 was multiplied by 0.5, to reflect the assumption that 50% of the perimeter of the longwall panel will experience subsidence cracking. This is a highly conservative assumption (even though the northern mining area will experience dual seam mining), given that experience from operating mines in the Bowen Basin have shown that cracking as a result of subsidence typically affects less than 20% of the perimeter of the longwall panel.

3. The length of vegetation (from Step 2) was multiplied by 3 m. This assumes conservatively that, in undertaking rehabilitation of the subsidence crack, it would be necessary to disturb a width of 3 m in woodland. The width of disturbance caused by the subsidence cracking itself is generally predicted to be less than 0.2 m, and the disturbance width has been selected for the purpose of providing access by small earthmoving equipment (e.g. a backhoe or tractor).

The estimated vegetation disturbance area was calculated for each longwall panel, as per the method described above.

A review of mapped woodland vegetation on the project site was undertaken and indicates that due to the open nature of the vegetation and the existing tracks and clearing on the project site, areas of subsidence cracking will be accessible to the equipment required for undertaking crack rehabilitation. It is therefore not anticipated that it will be necessary to clear vegetation for the purpose of creating tracks/providing access.

It should be noted that the vegetation disturbance areas presented in this report are intended to provide indicative disturbance areas, rather than being accurate predictions of disturbance for each vegetation community as it is not possible to accurately predict the location of individual cracks prior to mining. This limitation has, however, been overcome by making use of a conservative prediction method, and assuming cracks along 50% of the perimeter of the longwall panel which is well in excess of the monitored crack frequency at operating longwall mines in Central Queensland.

CUMBERLAND ECOLOGY

Table N.1 Summary of Vegetation Disturbance due to the Repair of Subsidence Cracks

RE Code	Vegetation Type	Conservation Status			Disturbance (ha)
		EPBC Act[1]	VM Act[2]	Biodiversity Status[2]	
10.3.6	Eucalyptus open woodland	-	Least Concern	No concern at present	0.3
10.3.11a	Yellowjacket woodland	-	Least Concern	No concern at present	2.0
10.3.14d	Eucalyptus with or without Yellowjacket open woodland along watercourses	-	Least Concern	Of Concern	0.6
10.3.15k	Eucalyptus open woodland	-	Least Concern	Of Concern	0.7
10.5.1a	Eucalyptus open woodland	-	Least Concern	No concern at present	12.4
10.5.1c	Eucalyptus and Rough-leaved Bloodwood low open woodland	-	Least Concern	No concern at present	0.1
10.5.1d	Rough-leaved Bloodwood low open woodland	-	Least Concern	No concern at present	0.1
10.5.4	Eucalyptus open woodland	-	Least Concern	No concern at present	0.6
10.5.4b	Narrow-leaved Ironbark open woodland	-	Least Concern	No concern at present	0.9
10.5.5a	Silver-leaved Ironbark open woodland	-	Least Concern	No concern at present	0.7
10.5.10	Yellowjacket open woodland	-	Least Concern	No concern at present	0.01
10.7.3c	Shiny-leaved Bloodwood and/or *C. leichhardtii* open woodland	-	Least Concern	No concern at present	3.4
10.7.12a	Narrow-leaved Ironbark open woodland	-	Least Concern	No concern at present	3.9
10.10.1a	Lancewood woodland	-	Least Concern	No concern at present	10.6
10.10.3	Narrow-leaved Ironbark open woodland	-	Of Concern	Of Concern	1.9
10.10.4a	Yellowjacket open woodland	-	Least Concern	No concern at present	8.5

RE Code	Vegetation Type	Conservation Status			Disturbance (ha)
		EPBC Act[1]	VM Act[2]	Biodiversity Status[2]	
10.10.4c	Inland Yellow Jacket open woodland	-	Least Concern	No concern at present	6.5
10.10.5a	White Bloodwood usually with Shiny-leaved Bloodwood open woodland	-	Least Concern	No concern at present	0.1
				TOTAL* (ha)	**53.2**

* In some cases totals may not equal the appropriate total number due to rounding.

Table N.2 Summary of High Value Habitat Disturbed due to Repair of Subsidence Cracks

Species	Conservation Status[1]		High Value Habitat in the Study Area (ha)^	High Value Habitat Disturbance (ha)	% Cleared
	EPBC Act	NC Act			
Squatter Pigeon (southern subspecies)	V	V	2,004	8.3	0.4
Black-throated Finch (white-rumped subspecies)	E	E	2,632.2	9.8	0.4
Australian Painted Snipe	E	E	123.2	0.03	0.02
Koala	V	SLC	3,632	21	0.6
Short-beaked Echidna	-	SLC	5,346.2	24.2	0.5

[1] Threatened and/or Special Least Concern species status under the EPBC Act and/or NC Act (current at 6 March 2015).

E = Endangered; V = Vulnerable; SLC = Special Least Concern

^ Excludes the area that would be cleared as a result of the open cut mining area and associated mine infrastructure area.

Appendix O

Proposed Remedial Drainage

CUMBERLAND ECOLOGY

Table O.1 Summary of Vegetation Disturbance due to the Construction of Drains

RE Code	Vegetation Type	Conservation Status			Disturbance (ha)
		EPBC Act[1]	VM Act[2]	Biodiversity Status[2]	
10.3.6	Eucalyptus open woodland	-	Least Concern	No concern at present	0.1
10.3.11a	Yellowjacket woodland	-	Least Concern	No concern at present	0.1
10.3.15k	Eucalyptus open woodland	-	Least Concern	Of Concern	0.4
10.5.1a	Eucalyptus open woodland	-	Least Concern	No concern at present	8.5
10.5.1d	Rough-leaved Bloodwood low open woodland	-	Least Concern	No concern at present	0.002
10.5.4	Eucalyptus open woodland	-	Least Concern	No concern at present	0.1
10.5.5a	Silver-leaved Ironbark open woodland	-	Least Concern	No concern at present	0.1
10.5.10	Yellowjacket open woodland	-	Least Concern	No concern at present	0.005
10.7.12a	Narrow-leaved Ironbark open woodland	-	Least Concern	No concern at present	2.9
10.10.4a	Yellowjacket open woodland	-	Least Concern	No concern at present	0.1
				TOTAL* (ha)	12.2

* In some cases totals may not equal the appropriate total number due to rounding.

CUMBERLAND ECOLOGY

Table O.2 Summary of High Value Habitat Disturbed due to Construction of Drains

Species	Conservation Status[1]		High Value Habitat in the Project Site (ha)^	High Value Habitat Disturbance (ha)	% Cleared
	EPBC Act	NC Act			
Squatter Pigeon (southern subspecies)	V	V	2,004	3.2	0.2
Black-throated Finch (white-rumped subspecies)	E	E	2,632.2	9.2	0.3
Australian Painted Snipe	E	E	123.2	2.7	2.2
Koala	V	SLC	3,632	0.4	0.01
Short-beaked Echidna	-	SLC	5,346.2	12.2	0.2

[1] Threatened and/or Special Least Concern species status under the EPBC Act and/or NC Act (current at 6 March 2015).

E = Endangered; V = Vulnerable; SLC = Special Least Concern

^ Excludes the area that would be cleared as a result of the open cut mining area and associated mine infrastructure area.