Isaac Plains East - Offset Area Management Plan: EPBC 2016/7827

Stanmore IP Coal Pty Ltd

BASE/

Client	Stanmore IP Coal
Reference	J0053

Document Control

Title	Isaac Plains East Offset Management Plan
Job Number	J0053
Client	Stanmore IP Coal Pty Ltd

Document Issue

Issue	Date	Prepared By	Reviewed/Approved By
DRAFT 1	5/6/2018	Craig Streatfeild	Ross Marshall
DRAFT 2	20/7/2018	Craig Streatfeild	Craig Streatfeild
DRAFT 3 Client Review	23/7/2018	Craig Streatfeild	Richard Oldham
FINAL for Submission to DoEE	25/7/2018	Craig Streatfeild	Craig Streatfeild
Rev 2 Addressing DoEE Comments	3/9/2018	Craig Streatfeild	Richard Oldham
Rev 3 Response to Additional DoEE Comments	22/9/2018	Craig Streatfeild	Richard Oldham
Rev 4 Final submission to DoEE	27/9/2018	Craig Streatfeild	Richard Oldham
Rev 0 – Update to include RE assessment	16/09/2019	Craig Streatfeild/Lincoln Smith	Craig Streatfeild
Rev 01 – Update for new offset area: Client review	17/2/2021	Craig Streatfeild/Isaac Witten	Craig Streatfeild /Richard Oldham
Rev 02 – Response to client comments: Submission to DAWE	23/2/2021	Craig Streatfeild/Isaac Witten	Craig Streatfeild /Richard Oldham
Rev 03 – Response to comments from landholders	14/3/2021	Craig Streatfeild/Josh Tomarchio	Craig Streatfeild /Richard Oldham
Rev 04 – Submission to DAWE	15/3/2021	Craig Streatfeild/Josh Tomarchio	Craig Streatfeild /Richard Oldham
Rev 05 – Responses to DAWE comments	22/04/2021	Craig Streatfeild	Richard Oldham
Rev 06 – Responses to DAWE comments	05/05/2021	Craig Streatfeild	Richard Oldham

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Approval Holder Declaration

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Biodiversity Offset Management Plan that was supplied by the proponent is complete, current and correct.

2. I am duly authorised to sign this declaration on behalf of the approval holder.

3. I am aware that:

a. Section 490 of *the Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.

b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* where the person knows the information or document is false or misleading.

c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed:_____

Full name:_____

Organisation: _____

Date:___ / ___/ _____

I have read and agree to this Management Plan applying to the Offset Area shown in it.

Signed:_____

Landholder name:_____

Signed:_____

Queensland Department of Resources representative:_____

Abbreviations

Abbreviation	Description
ABN	Australian Business Number
ACN	Australian Corporation Number
BPA	Biodiversity Planning Assessment
BVG	Broad Vegetation Group
DAF	Department of Agriculture and Fisheries
DAWE	Department of Agriculture, Water and the Environment
DBH	Diameter at Breast Height
DEHP	Department of Environment and Heritage Protection
DES	Department of Environment and Science
DEWHA	Department of Environment, Heritage, Water and The Arts
DNRME	Department of Natural Resources, Mines and Energy
DoE	Department of Environment
DoEE	Department of The Environment and Energy
EDL	Ecologically Dominant Layer
EO Act	*Environmental Offsets Act 2014*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ha	Hectares
ID	Isaac Downs
IPE	Isaac Plains East
IPEE	Isaac Plains East Extension
km	Kilometres
MNES	Matters of National Environmental Significance
m	Metres
NC Act	*Nature Conservation Act 1992*
OMP	Offset Management Plan
RE	Regional Ecosystem
SPRAT	Species Profile and Threats Database
VM Act	*Vegetation Management Act 1999*

1.0 Introduction

Base Consulting Group (Base) was commissioned by Stanmore IP Coal Pty Ltd (Stanmore) to prepare this Offset Management Plan (OMP) for impacts to listed Commonwealth fauna species from operations at the Isaac Plains East (IPE) Project (the Project). The Project has been approved by both State and Commonwealth Governments and this OMP has been developed to address residual impacts to Matters of National Environmental Significance (MNES) that require offsetting as outlined in the Commonwealth approval (EPBC 2016/7827) issued on **28 February 2018**.

The OMP was approved by the then Department of Energy and the Environment (DoEE) in October 2018 with a commitment made to undertake detailed mapping to groundtruth and quantify the Regional Ecosystem (RE) boundaries within a previously identified offset area. The revised OMP including the groundtruthed RE boundaries was approved by DoEE in September 2019.

Subsequent to the September 2019 approval, negotiations between Stanmore and the landowner failed to reach an agreement on legal security of the proposed offset. As such, Stanmore requested an extension to Condition 6 of the EPBC approval to extend legal security of the offset area from 2 years to 3 years and the variation to approval conditions was granted in August 2020. This variation also amended the definition of Squatter Pigeon habitat.

This OMP includes habitat mapping, habitat quality scores and the locations of the observed MNES that require offsetting within a new offset area of 290 ha within Lot 4SP277438 which is 4811 ha in size. Management actions, performance criteria and competition criteria for the offset area are also outlined.

1.1 Background

Stanmore is the operator of the Isaac Plains Complex (IPC), which comprises the Isaac Plains Mine (IPM) and Isaac Plains East (IPE) mining areas. The IPC is an operating metallurgical open cut coal mine located approximately 5 km northeast of Moranbah in Central Queensland (see Figure 1). Mining operations are carried out under an existing State Government approved environmental authority (EA) and occurs across several approved mining leases (ML), namely ML 70342, ML 700016, ML 700017, ML 700018 and ML 700019.

The IPM originally commenced operation in 2006 and produced approximately 2.8 million tonnes per annum (Mtpa) of coking coal for export to international markets. The IPM was put into care and maintenance by the previous owners and was acquired by Stanmore in late 2015, who recommenced operations from the existing open cut pit. In 2018, approval was received from State and Commonwealth Governments for the IPE project which involved mining on ML 700016, ML 700017, ML 700018, ML 700019 (see Figure 2). State and Commonwealth approvals for the IPE Project limited the disturbance footprint of proposed activities within the approved mining leases.

1.2 Report Scope and Purpose

The purpose of this OMP is to satisfy the requirements of the Commonwealth approval conditions for significant residual impacts to the MNES which are the Koala (*Phascolarctos cinereus*), Greater Glider (*Petauroides Volans*) and the Squatter Pigeon (Southern) *(Geophaps scripta scripta).* The approval conditions are outlined in Table 2 and 3. This OMP proposes to legally secure offsets within Mt Spencer Station (Figure 3) as an offset for authorised residual impacts to 125 ha of Koala and Greater Glider habitat and 74 ha of Squatter Pigeon habitat as outlined in Table 1. It is the intent of Stanmore to collocate all required offsets within an area of 290 ha within Mt Spencer Station.

Stanmore's Isaac Plains East Extension (IPEE) project was approved by DAWE in December 2020 (EPBC 2019/8548). IPEE adjoins IPE (the subject of this OMP). The IPEE approval included approval of an offset area management plan (OAMP) for an offset area on Mt Spencer, which adjoins the 290 ha offset area described in this OMP. This OMP adopts the same offset area management actions as approved in the IPEE OAMP.

1.2.1 Scope

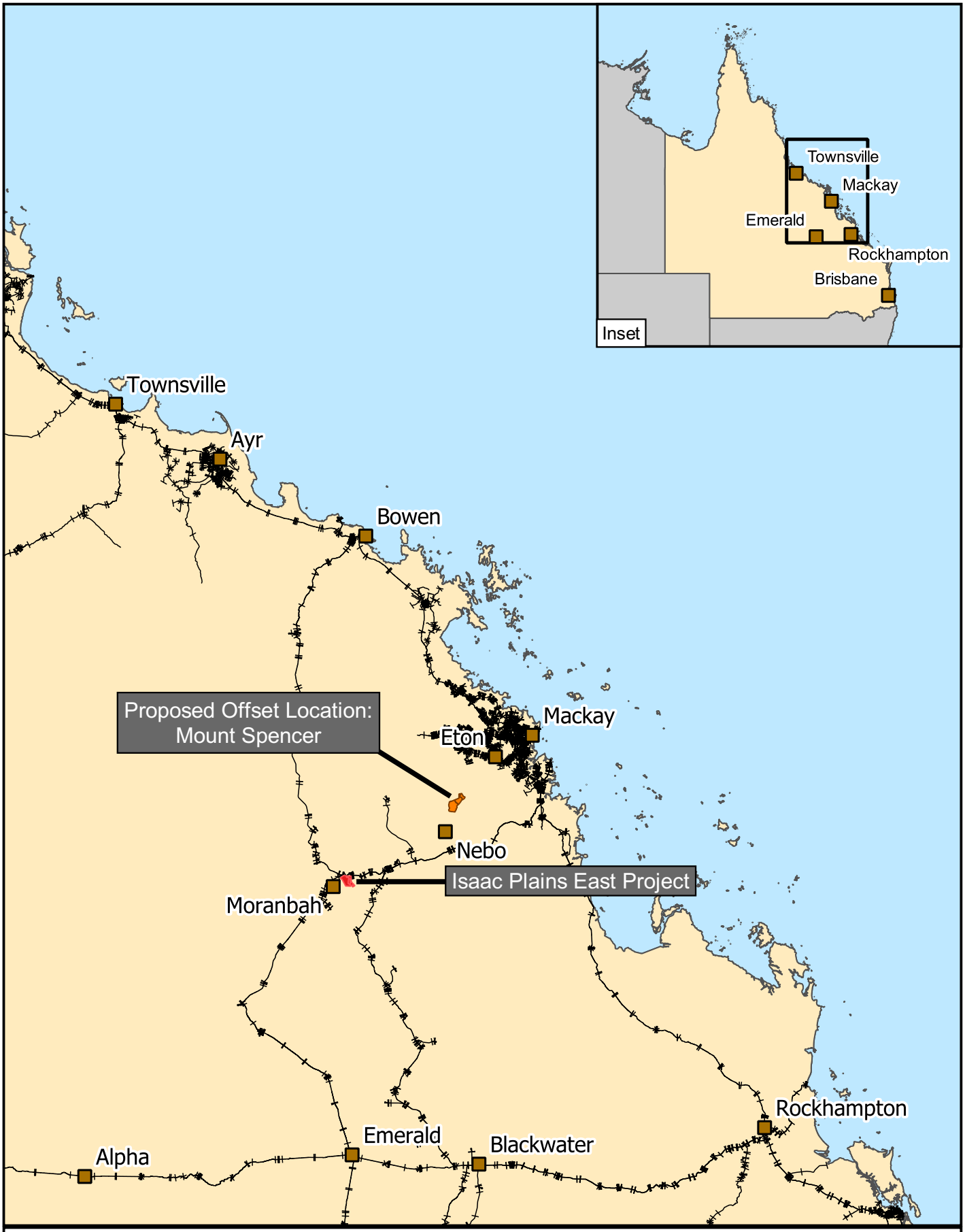
The purpose of this OMP (IPE) is to offset significant residual impacts to the Koala, Greater Glider and Squatter Pigeon (breeding and foraging habitat) for the IPE project. This OMP proposes to legally secure offset areas within Mt Spencer Station (Figure 3) as an offset for authorised residual impacts to 125 ha of Koala and Greater Glider habitat, 74 ha of Squatter Pigeon habitat (refer to Table 1). While this OMP focuses on offsetting the IPE, it is the intent of Stanmore to also locate offsets required for impacts to the Koala, Greater Glider and Squatter Pigeon for their other projects (IPEE which has an approved offset and other future projects such as Isaac Downs (ID) which is currently in the assessment phase) within Lot 4SP277438 which is part of the wider Mt Spencer Station (Figure 3). To this end, a larger approximately 3000ha offset investigation area has been identified for the IPEE and other future Stanmore projects that adjoins the IPE offset area to the north and south. An OMP for the IPEE offset area that adjoins the IPE proposed offset area to the north was approved by the Department of Agricultural, Water and Energy (DAWE) in December 2020.

This OMP proposes ongoing management and monitoring of the offset area to satisfy the requirements of the Commonwealth's Offset Policy and approval conditions. In accordance with the Commonwealth Offset Policy, management of the offset area in accordance with this plan is for a 20 year period.

Table 1 MNES impacted by the Project for which offsets will be delivered

MNES	EPBC Act status	Impact area requiring offsets (ha)	Required offset area (ha)
Koala *(Phascolarctos cinereus)*	Vulnerable	125	217
Greater Glider *(Petauroides volans)*	Vulnerable	125	290
Squatter Pigeon (Southern) *(Geophaps scripta scripta)*	Vulnerable	74	172

Detailed ecological field investigations of the impact area have been undertaken to support the IPE project. As part of these investigations, habitat quality assessments were undertaken to inform the offset requirements for the IPE project. These habitat quality scores are included to provide an overview of habitat quality in the impact area and to describe the process undertaken to determine the habitat quality scores.



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Date: 04/02/2021
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2020; QSPATIAL 2020; The State of Queensland (Department of Natural Resource and Mines) 2020;

Figure 1: Mine and Proposed Offset Site Context

Legend

- Towns
- Highways
- Roads
- Rail Network
- Isaac Plains East
- Mount Spencer (Lot 4SP277438)

BASE/

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Date: 05/02/2021
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2021; QSPATIAL 2021; The State of Queensland (Department of Natural Resource and Mines) 2021;

Figure 2: Regional Ecosystems Within The Disturbance Footprint

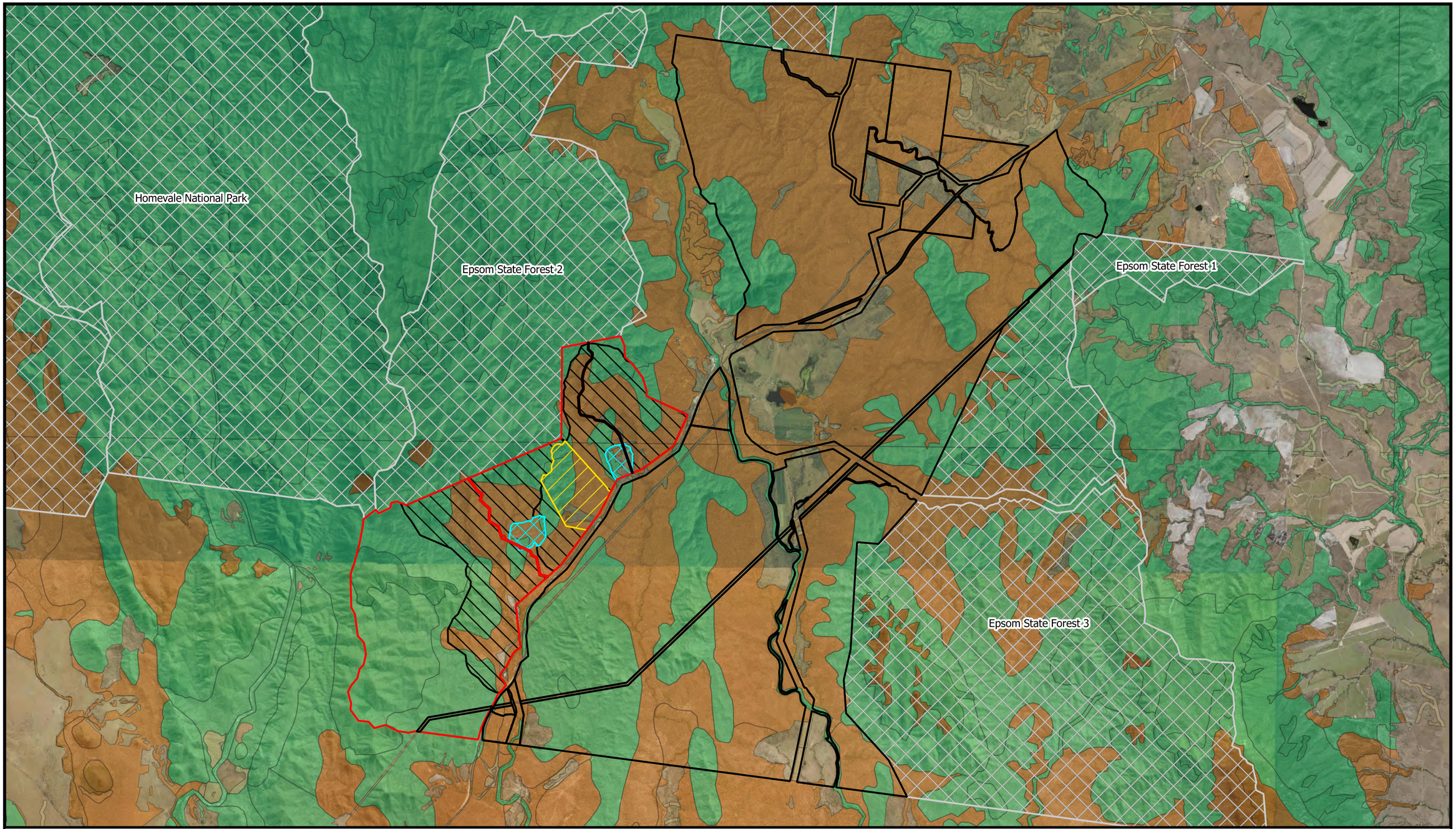
Legend

- Railway
- Watercourses
- Highways
- Issac Plains Complex
- Existing Isaac Plains Mine
- IPE Mine Lease
- IPE Impact Area

Regional Ecosystem
- Remnant Vegetation: Least Concern
- Remnant Vegetation: Of Concern

High Value Regrowth
- Endangered

BASE/



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DATA SOURCE:
BASE CONSULTING GROUP 2021; QSPATIAL 2021; The State of Queensland (Department of Natural Resource and Mines) 2021;

Figure 3: Mount Spencer Station with Offset Investigation Area

Legend

- Existing Fenceline
- Mount Spencer Station
- Lot 4SP277438
- Protected Areas
- Offset Investigation Area
- IPE Offset Area
- Holding Yards
- Category A or B: Of Concern
- Category A or B: Least Concern
- Category C: Least Concern
- Category C: Of Concern

BASE/

2.0 Regulatory Framework

2.1 *Environment Protection and Biodiversity Conservation Act 1999* – Commonwealth

The EPBC Act is the Commonwealth Government's principal piece of environmental legislation and is administered by the DAWE. The EPBC Act is designed to protect MNES, which include threatened species of flora and fauna, threatened ecological communities (TECs), migratory species as well as other protected matters. The Act includes EPBC 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.

2.2 Conditions of Approval

The EPBC approval decision (EPBC 2016/7827) for the Project was received on **28 February 2018** with conditions varied on 14 August 2020. Conditions 5 to 7 of the EPBC Act approval are relevant to the development of this OMP and are detailed in Sections 2.2.1 and 2.2.2. In addition, the previous version of the OMP was approved by the then DoEE on 2 October 2018.

2.2.1 Condition 5

Condition 5 of the EPBC Act approval relates to the requirements to develop and have approved, an OMP for the MNES listed in Condition 2 of the approval and outlined in Table 1 of this OMP. The condition and where it has been addressed in this OMP are outlined in Table 2.

Table 2 EPBC Act approval condition 5 addressed as part of this OMP

Condition	Summary of condition	Relevant section
Condition 5	The approval holder must submit an Offset Management Plan for the written approval of the Minister. The approved Offset Management Plan must be implemented. The Offset Management Plan must be prepared by a suitably qualified person in accordance with the Department's Environmental Management Plan Guidelines and include:	This document includes all key requirements as set out in Environment Management Plan Guidelines. Appendix A outlines the experience of the suitably qualified BASE personnel involved in the preparation of this OMP.
Condition 5 (a)	Details of environmental offset/s to compensate for the habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)* and Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat to be cleared as identified in condition 2;	Refer to sections 3.2and 4.3.
Condition 5 (b)	Details of how the proposed offset/s and Offset Management Plan meet the requirements of the EPBC Act Environmental Offsets Policy;	Refer to section 4.7
Condition 5 (c)	A field validation survey and baseline description of the current condition (prior to any management activities) of the offset area/s, including existing vegetation, for habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider	Refer to sections 4.1, 4.2 and 4.3

Condition	Summary of condition	Relevant section
	(Petauroides volans), and Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat;	
Condition 5 (d)	A description and map (including shapefiles) to clearly define the location and boundaries of the proposed offset area/s, accompanied by the offset attributes;	Refer to section 4.3, Figure 6 and Figure 7. Shape files will be provided.
Condition 5 (e)	Information about how the proposed offset area/s provide connectivity with other relevant habitats and biodiversity corridors;	Refer to section 4.3
Condition 5 (f)	A description of the management measures (including timing, frequency and duration) that will be implemented in each offset area/s;	Refer to sections 5.0 and 6.0
Condition 5 (g)	A discussion of how proposed management measures take into account relevant approved conservation advices and are consistent with the measures contained in relevant recovery plans and threat abatement plans;	Refer to section 5.0
Condition 5 (h)	Completion criteria and performance targets for evaluating the effectiveness of Offset Management Plan implementation, and criteria for triggering corrective actions;	Refer to section 5.1
Condition 5 (i)	A program to monitor, report on and review the effectiveness of the Offset Management Plan;	Refer to section 7.0
Condition 5 (j)	A description of potential risks to the successful implementation of the offset/s, and contingency measures that would be implemented to mitigate against these risks;	Refer to section 9.0
Condition 5 (k)	Details of the mechanism to legally secure the environmental offset/s.	Refer to section 4.6

2.2.2 Conditions 6 and 7

Conditions 6 and 7 of the EPBC Act approval relate to legally securing the offset and the requirement of not undertaking any clearing of habitat for the MNES listed in Table 1 of this OMP until the OMP has been approved. These conditions and where they have been addressed are outlined in Table 3.

Table 3: EPBC Act approval conditions 6 and 7 addressed as part of this OMP

Condition	Summary of condition	Relevant section
Condition 6 (as varied on 14 August 2020)	The approval holder must legally secure the environmental offset/s within three (3) years from the commencement of the clearance of habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)* and Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat.	Refer to section 4.6
Condition 7	The approval holder must not clear habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)* and Squatter Pigeon (Southern) *(Geophaps scripta*	The Minister approved a previous version of the OMP on 2 October 2018. Clearing commenced on 17 October

Condition	Summary of condition	Relevant section
	scripta) habitat until the Minister has approved the Offset Management Plan.	2018, following approval of the OMP.

Approval is required under the EPBC Act for any action (development) that has the potential to significantly impact MNES. Proponents of projects that are likely to have a significant impact refer the project to the DAWE for a determination on whether the proposed activity requires assessment under the EPBC Act via a controlled action, and if so, the level of assessment required. For controlled actions, five different levels of assessment are possible and include assessment based on information provided in the referral, assessment by preliminary documentation, assessment by an Environmental Impact Statement (EIS), assessment by a Public Environment Report (PER) and assessment by public enquiry.

Under the *Environment Protection and Biodiversity Conservation* 1999 (EPBC Act) Environmental Offsets Policy, offsets are required where a residual impact is likely to occur after avoidance, mitigation and management measures have been undertaken. For this project, offsets for residual impacts are to be legally secured for the MNES in Table 1.

2.3 Policy Principles

The EPBC Act Environmental Offsets Policy (October 2012), has five key aims that involve:

- Ensuring the use of offsets are efficient, effective, timely, transparent and scientifically robust;
- Providing all stakeholders with greater certainty on how offsets are determined and provided;
- Delivering improved environmental outcomes;
- Outlining the appropriate nature and scale of offsets; and
- Providing guidance on acceptable offsets and their delivery.

The Policy also provides eight key principles that are applied in determining the suitability of offsets as follows. These principles are addressed in further detail in Section 4.7.

- Deliver an overall conservation outcome that improves or maintains the viability of the MNES in question;
- Be primarily built around direct offsets but may also include other compensatory measures;
- Be in proportion to the level of statutory protection that applies to the MNES;
- Be of a size and scale proportionate to the residual impacts on the protected matter;
- Account for and manage the risks of the offset not succeeding;
- Be additional to what is already required under law or regulations;
- Be efficient, effective, timely, transparent, scientifically robust and reasonable; and
- Have transparent governance arrangements including management actions, monitoring and auditing.

Lot 4SP277438 which is part of Mt Spencer Station, has approximately 4700 ha of remnant vegetation that has the potential to provide offsets for impacts to the MNES. Further, Mt Spencer Station (inclusive of Lot 4) covers 22,712 ha which includes approximately 20,190 ha of remnant vegetation that has the potential to provide offsets for impacts to the MNES.

The identified 290 ha offset area, to which this OMP applies, is located on the north-eastern section of the property and has the potential to provide offsets that offer additional environmental values over and above those required (Figure 3). Offsets for all three MNES have been co-located within the 290 ha Greater Glider offset area and it is the intent of Stanmore to manage the total offset area as a whole. The exception being the installation of Greater Glider artificial nest boxes and their ongoing management and maintenance (see Sections 6.1 and 7.4). These boxes will generally be confined to the riparian area of RE 11.3.4 and a yet to be defined buffer area. The width of the buffer area will be determined during the first comprehensive ecological survey and will be based on the habitat features that support nest box installation. An overview of the Mt Spencer Station offset area is described in Section 4.3.

3.0 Biodiversity Values Requiring Offsets

As part of the Project's State and Commonwealth approvals process, several detailed ecological surveys and assessments have been undertaken across the IPE project area including those studies undertaken as part of the approvals process in 2015/2016 (EcoSM, 2020).

Detailed and targeted ecological assessments were undertaken as part of the 2015/2016 surveys. Subsequent surveys undertaken in 2018 and focussed on habitat quality assessments for the Koala, Greater Glider and Squatter Pigeon. Habitat quality assessments are discussed further in Section 4.1 and Section 4.2

Collectively, these surveys and assessments were undertaken, in order to:

- Determine the presence/absence of listed flora and fauna species within the Project area;
- Assess the vegetation characteristics and the presence of ecological communities within the Project area;
- Describe the likely adverse impacts on MNES within the Project area;
- Describe measures that would be implemented to avoid and mitigate impacts on those MNES; and
- Assess the baseline habitat quality of the impact area for the MNES requiring offsets.

This section provides a summary of the ecological assessments undertaken to determine the likelihood of occurrence of fauna MNES to occur or potentially occur, within the IPE Project area and to assess the potential impacts to those MNES.

3.1 Impact Assessment Ecological Survey Effort

A variety of flora and fauna survey methods were used to detect MNES during the assessment surveys (EcoSM, 2020). Flora surveys were undertaken in accordance with the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 3.2 (Nelder et al., 2012).

3.1.1 Fauna Assessment of the impact area

Fauna assessments were undertaken for the IPE surveys undertaken in 2015 and 2016 and included systematic trap sites, spotlighting, call playback, infrared cameras, active searching, supplementary survey sites, harp traps, Anabat survey sites, Koala transects and observation (e.g. bird surveys and opportunistic observations). The survey techniques were applied across eight systematic trap sites and a range of supplementary sites and involved a total of:

- 800 Elliott A trap nights;
- 112 pitfall trap nights;
- 224 funnel trap nights;
- 24.5 hrs of spotlighting;
- 10 hrs nocturnal owl and Koala call playback sessions;
- 207 infrared camera trap nights;
- 55 hrs targeted diurnal bird survey hours;
- 180 hrs opportunistic incidental bird survey hours;

- 22 hrs active searching hours;
- 16 Anabat survey nights;
- 14 harp trap nights; and
- 12 Koala transects totalling 104.2 ha or survey area.

Survey methods were undertaken in accordance with applicable Commonwealth and Queensland threatened species and communities survey guidelines including:

- Commonwealth guidelines;
    - Survey guidelines for Australia's threatened birds (DEWHA, 2010a)
    - Survey guidelines for Australia's threatened bats (DEWHA, 2010b)
    - Survey guidelines for Australia's threatened reptiles (SEWPaC, 2011a)
    - Survey guidelines for Australia's threatened mammals (SEWPaC, 2011b)
    - EPBC Act referral guidelines for the vulnerable Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DotE, 2014)
    - SPRAT databases for relevant EPBC Act listed species and communities (as of July 2016)
- Queensland guidelines;
    - Flora Survey Guidelines – Protected Plants *Nature Conservation Act 1992* (EHP, 2014)
    - Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al., 2014).

3.2 MNES Requiring Offsets

The ecological assessments identified three fauna species (Koala, Greater Glider and Squatter Pigeon) listed as vulnerable under the EPBC Act as requiring offsets due to residual impacts occurring to the species habitat. Note, no significant residual impact to Squatter Pigeon dispersal habitat is predicted and as such, no offsets are proposed for impacts to this habitat. Offsets are proposed for impacts to Squatter Pigeon breeding and foraging habitat

Those MNES for which this OMP applies as outlined in the EPBC approval conditions and the corresponding impacts areas are shown in Table 4.

Table 4 MNES impacted by the Project for which offsets will be required

MNES	EPBC Act status	Impact area requiring offsets (ha)
Koala *(Phascolarctos cinereus)*	Vulnerable	125
Greater Glider *(Petauroides volans)*	Vulnerable	125
Squatter Pigeon (Southern) *(Geophaps scripta scripta)*	Vulnerable	74

3.2.1 Koala (Phascolarctos cinereus)

Description

The Koala is one of Australia's most distinctive wildlife species (TSSC, 2012). It is a large grey, arboreal mammal with woolly fur, long black claws, a large black nose, fluffy ears, and no tail (van Dyck & Strahan, 2008). They have a head and body length of approximately 65-74 cm depending on sex with males larger than females and they can weigh up to 9 kg (van Dyck & Strahan, 2008).

Distribution

The Koala is found in eastern Australia in fragmented populations, from the temperate south to the tropical north. In Queensland, the Koala is widespread in sclerophyll forest and woodlands on foothills and plains on both sides of the Great Dividing Range from about Chillagoe, Queensland to Mt Lofty Ranges in South Australia (Menkhorst & Knight, 2011).

Habitat

Koalas use a range of habitats, including temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species. However, they are strongly associated with eucalypt forests which it feeds on (van Dyck & Strahan, 2008). This species feeds on approximately 50 different eucalypt species across its range, with food preferences varying locally and across regions (Krockenberger et. al., 2012). The South East Queensland Koala Conservation State Planning Regulatory Provisions define Koala food trees as species of the *Corymbia*, *Melaleuca*, *Lophostemon* or *Eucalyptus* genera (DES, 2017; DotEE, 2017c).

Any forest or woodland containing species that are known Koala food trees, or shrubland with emergent food trees provides potential Koala habitat. The Koala is also known to occur in modified or regenerating native vegetation communities (DoEE, 2017c).

It has been suggested that shelter (non-food) trees are important to Koalas, with Crowther et. al. (2013) indicating that shelter trees are equally important as food tree. Shelter trees play an essential role in thermoregulation and are likely to be selected based on height,

canopy cover and elevation, with large trees occurring in gullies being preferable (Crowther et. al., 2013).

Suitable Habitat Within the Offset Area

Based on the SPRAT habitat description and the habitat definition included in the EPBC Act approval conditions, forests, woodlands or emerging shrublands, including riparian and non-riparian environments that contain one or more of *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and *Melaleuca* tree species are all potential Koala habitat. This is further supported by Atlas of Living Australia records which show Koalas have been previously found immediately adjacent to the investigation area and along the Peak Downs Highway (Figure 4). The presence of Koalas is also supported by anecdotal evidence from the landowner who has indicated that Koalas have previously been seen within the investigation area and throughout the wider Mt Spencer Station (D. Wright *pers comm.*).

Desktop assessment including the Atlas of Living database, showed numerous Koala records along the Peak Downs Highway that borders the broader offset investigation area and the IPE offset area to the (see Figure 4). Koalas have also been recorded along the Peak Downs Highway immediately adjacent to Mt Spencer during the DTMR Koala Research Project (Melzer et al. 2018).

Field assessments undertaken in June, July and October 2020 confirmed the presence of the Koala throughout of broader offset investigation area. Over the three field visits, 13 instances of Koala sightings (Figure 5 MNES occurrences in offset area) were recorded and throughout the offset investigation area as were evidence of Koalas in the form of tree scratches and scats. Koalas were confirmed as occurring throughout the broader offset investigation area, including the approved IPEE offset area immediately to the north of the IPE offset area, as well as to the south of the IPE offset area. Although Koalas were not confirmed as present within the IPE offset area during the time of the surveys (Figure 5), given the proximity of confirmed Koala locations to the IPE boundary (closest confirmed record is approximately 900 m to the north-east and a fresh scat was found 1.5 km to the south-west during the June and October 2020 survey events, respectively) and the home range size of Koalas, the species has a very high probability of occurring within the IPE offset area.

The minimum offset area required for the Koala is 217 ha and will be co-located with the Greater Glider and Squatter Pigeon within the larger 290 ha area required for the Greater Glider (refer to section 3.2.2). Field verified Regional Ecosystem mapping shows the offset management area consists of a Eucalypt Woodland BVG comprising two (2) REs and non-remnant ecosystems. The offset area is dominated by vegetation consistent with REs 11.12.1 and 11.3.4 and the area is considered appropriate habitat for Koala. These REs support known Koala food trees and are consistent with the habitat definitions within the EPBC approval conditions.

Start habitat quality calculations for the Koala within the 217 ha offset area averaged a 4 out of 10. An increase in habitat quality will be realised through various management actions outlined in section 6.0.

Key Threats

Wildfire and drought are semi-natural processes that are considered to threaten Koala populations, particularly in dryland areas where water sources and the availability of shelter trees have been anthropogenically altered (TSSC, 2012). Other threats to the Koala are the loss and fragmentation of habitat resulting in loss of food and shelter trees, increased risk of vehicle strike, dog attacks and isolation of populations (TSSC, 2012). Habitat fragmentation results in isolated high-density population areas where the risk of disease transmission is increased and the potential to recolonise dryland areas post-drought is impeded (TSSC, 2012).

3.2.2 Greater Glider (*Petauroides volans*)

Description

The Greater Glider is the largest gliding possum in Australia, with a head and body length of approximately 35-46 cm and a long furry tail measuring approximately 45-60 cm. The Greater Glider has thick fur that is white or cream below and varies from dark grey, dusky brown through to light mottled grey and cream above (TSSC, 2016). The Greater Glider is nocturnal and uses tree hollows during the day to rest and/or nest (van Dyck & Strahan, 2008).

Distribution

Greater Gliders are restricted to eastern Australia, between Windsor Tableland in north Queensland and Wombat State Forest in central Victoria and occurs from sea level up to 1,200 m above sea level. Two isolated subpopulations exist in Queensland, one in the Gregory Range west of Townsville and another in the Einasleigh Uplands (TSSC, 2016).

Habitat

The Greater Glider occurs in a range of eucalypt-dominated habitats, including low open forests on the coast to tall forests in the ranges and low woodland to the west of the Dividing Range. It does not use rainforest habitats (van Dyck & Strahan 2008; van Dyck et. al., 2013). This species favours taller, montane, moist eucalypt forests with relatively old trees and abundant hollows and a diversity of eucalypt species (TSSC, 2016).

The Greater Glider has an almost exclusive diet of eucalypt leaves but also feeds occasionally on flowers or buds (van Dyck & Strahan, 2008; TSSC, 2016). Although the species is known to feed on a range of eucalypt species, in any area it is likely to only forage on a select number of species (van Dyck & Strahan, 2008).

Suitable Habitat Within the Offset Area

The approved conservation advice for the Greater Glider (TSSC, 2016) along with habitat definitions included in the current EPBC Act approval, indicate that Greater Glider habitat overlaps Koala habitat. As such, forests, woodlands or emerging shrublands, including riparian and non-riparian environments that contain one or more of *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and *Melaleuca* tree species are all potential Greater Glider habitat.

Desktop assessment including the Atlas of Living Australia database, showed the multiple Greater Glider records approximately 8 km to the west of the offset investigation in similar habitat within the large and unfragmented Epsom State Forest and the adjacent which directly connects to the offset area (see Figure 4). Greater Gliders have also been recorded along the Peak Downs Highway in the vicinity of Mt Spencer during the DTMR Koala Research Project (Melzer et al. 2018).

Two Greater Gliders were confirmed as present within the broader offset investigation area during the October 2020 field assessments and were recorded approximately 1000 m south of 290 ha offset area and within the greater offset investigation area proposed for other Stanmore projects (Figure 5). Although the Greater Glider was not physically confirmed as present within the IPE offset area, sightings of Glider sp. with similar morphology to Greater Gliders, were observed along the Cut Creek riparian corridor within the approved IPEE offset area immediately adjacent to the IPE offset area and within habitat – RE 11.3.4 – that is known to support the Greater Glider (CDM Smith, 2018; ecosure, 2018). Yellow-bellied Gliders were positively identified in this area during the July survey but no confirmed sightings or calling activity were recorded in the October 2020 survey event. Yellow-bellied

Gliders are known to be boisterous and the lack of calling activity adds weight to the unconfirmed Glider sp. in the IPEE area being a Greater Glider. Although Greater Gliders were not confirmed within the boundary of the IPE offset area, several large tree hollows were observed along the riparian corridor which will provide suitable nesting and shelter habitat. As such and given the proximity of confirmed Greater Gliders to the IPE boundary (closest confirmed record is approximately 1 km to the south), the home range size of Greater Gliders in concert with the unconfirmed records along Cut Creek to the north and within the IPEE offset area, Greater Gliders have a very high probability of occurring within the IPE offset area.

The minimum offset area required for the Greater Glider is 290 ha and will be co-located with the Koala and Squatter Pigeon (Figure 6). On-ground assessments to remap the offset area confirmed the area comprises a Eucalypt Woodland BVG that is dominated by vegetation communities consistent with REs 11.12.1 and 11.3.4. These communities are considered appropriate habitat for the Greater Glider as the diverse Eucalypt community supports known Greater Glider habitat food and foraging trees.

Across the investigative area, start habitat quality for the Greater Glider averaged a 4 out of 10. An increase in habitat quality will be realised through various management actions including increasing habitat features (such as installation of artificial nest boxes), monitoring access and fencing, preventing vegetation clearing, and managing grazing, fire, pest animals and weeds (see section 6.0 for further details). These management actions along with installation of targeted artificial nest boxes are expected to increase the stocking rate from zero (0) to one (1) over the life of the offset.

Key Threats

Key threats to Greater Gliders are habitat loss leading to increased habitat fragmentation and loss of nesting habitat in tree hollows, predation by owls and frequent and intense bushfires. Loss of hollow bearing trees and distance between habitat patches in particular is thought to have contributed to the decline of Greater Gliders in central Queensland over the last 20 years (TSSC, 2016).

3.2.3 Squatter Pigeon - southern sub-species (*Geophaps scripta scripta*)

Description

EPBC Act = Vulnerable

The Squatter Pigeon (southern) is a medium-sized ground dwelling pigeon approximately 30 cm long. Adults of both sexes are generally grey-brown with black and white stripes on the face and throat, have iridescent green or violet patches on the wings, a blue-grey lower breast and white flanks and lower belly. The southern Squatter Pigeon sub-species has a patch of blue-grey skin around the eye, whereas the northern Squatter Pigeon has an orange-red orbital skin patch (TSSC, 2015).

Distribution

Squatter Pigeons are largely restricted to Queensland with the southern sub-species of the Squatter Pigeon known to occur north of the Burdekin River, east to Townsville and Proserpine and south to the Queensland-New South Wales Border and west as far as Longreach. Where Squatter Pigeon occurs, it can be locally abundant (Reis, 2012). The known distribution of the southern sub-species overlaps with the known distribution of the northern subspecies (DotEE, 2018).

The estimated extent of occurrence is approximately 440,000 km^2 (DotEE, 2018). The estimated total population of the species is an estimate as no systematic surveys have been undertaken. However, in 2000 the population was estimated at 40,000 breeding birds (Garnett & Crowley, 2000). Given the Squatter Pigeon's ubiquitous nature and relative abundance, the population is thought to be stable at present. It is also thought this species occurs as a single, contiguous (i.e. inter- breeding) population (DotEE, 2018).

Squatter Pigeons can occur in tropical dry, open sclerophyll woodlands and occasionally in savannah habitats with overstorey species of *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris*. Patchy groundcover layer is typical and generally consists of native, perennial tussock grasses or a mix of grasses and low shrubs or forbs. The groundcover layer rarely exceeds 33% of the ground area. It appears to favour sandy soil dissected with low gravely ridges and is less common on heavier soils with dense grass cover (DotEE, 2018). As outlined in the EPBC varied approval conditions, Squatter Pigeons are regularly found in close proximity (within 3 km) of a suitable, permanent or seasonal waterbody (DAWE, 2020) which can include farm dams and cattle watering points, wetlands and waterways.

Breeding Habitat

Squatter Pigeons nest on the ground, usually laying two eggs in sheltered positions amongst vegetation which are incubated for about 17 days (Crome, 1976; Frith, 1982). Their breeding habitat 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 (including, but not limited to, areas mapped as Queensland land zones 3, 5 or 7) and where groundcover vegetation is less than 33% of the ground area, within 1 km of a suitable, permanent or seasonal waterbody (DAWE, 2020).

Squatter Pigeons typically breed from April to October, although this is variable and highly dependent on food availability (Frith, 1982, Squatter Pigeon Workshop, 2011). Nests are depressions scraped into the ground beneath a tussock of grass, bush, fallen tree or log, and sparsely lined with grass (Frith, 1982). Chicks remain in the nest for two to three weeks and are dependent on their parents for around four weeks (DotEE, 2018a).

Foraging Habitat

As per the varied EPBC approval condition (DAWE, 2020), Squatter Pigeon foraging habitat 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 (including, but not limited to, areas mapped as Queensland land zones 3, 5 or 7) and where groundcover vegetation is less than 33% of the ground area, within 3 km of a suitable, permanent or seasonal waterbody (DAWE, 2020). It feeds primarily on seeds of grasses, herbs and shrubs but is also known to consume legumes, herbs and forbs, acacia seeds, insects and ticks (DotEE, 2018a).

Dispersal Habitat

Any forest or woodland occurring between patches of foraging or breeding habitat that facilitates movement between patches of foraging habitat, breeding habitat and/or waterbodies, and areas of cleared land less than 100 m wide linking areas of suitable breeding and/or foraging habitat (DoE, 2021.

Suitable Habitat Within the Offset Area

Squatter Pigeons have been previously found throughout Mt Spencer during previous property visits (D. Wright *pers. comm.*). Based on the EPBC approval habitat definition, the preliminary desktop assessment of the investigation area using current DNRME mapping suggests the majority of the broader offset investigation area has the potential to provide breeding and foraging habitat.

Field assessment in June and July 2020 located Squatter Pigeons throughout the broader offset investigation area and within the approved IPEE offset area immediately to the north. Squatter Pigeons were observed at five (5) separate locations during the June survey in the south-eastern section of the property and within a range of differing habitat types. Six (6) instances of Squatter Pigeons were recorded during the detailed survey in July 2020 and occurred in the southern, middle and north-east section of the broader offset investigation area (Figure 5). Although Squatter Pigeons were confirmed as occurring throughout the broader offset investigation area, including the approved IPEE offset area immediately to the north of the IPE offset area as well as to the south of the IPE offset area (Figure 5), they were not confirmed as present within the IPE offset area during the time of the surveys. Throughout the broader offset investigation area, Squatter Pigeons were found in various habitat types including the RE 11.3.4 and RE 11.12.1 as well as the non-remnant areas. Squatter Pigeons were also observed inhabiting vegetation with cover exceeding 33% and approximating 60% cover. Given the proximity of confirmed Squatter Pigeons to the IPE boundary (located approximately 1 km to the south, south-east during the June and July 2020 surveys as shown on Figure 5) and their occurrence throughout the broader area, the species has a very high probability of occurring within the IPEE offset area.

Squatter Pigeon breeding habitat covers the full IPE offset area as defined within the EPBC approval conditions and constrained to 1 km of permanent or semi-permanent waterways. The large area of 11.3.4 is a significant waterway that runs through the middle of the IPE offset area and provides a source of semi-permanent water, i.e. this is an ephemeral stream. Also, cattle watering points occur within the immediate vicinity of the offset area. By definition, the 172 ha offset area is also within 3 km of a permanent (cattle watering point) or semi-permanent waterway (mapped waterways) as shown on Figure 7. As shown on Figure 7, a permanent cattle watering point is in the eastern section of the IPE offset area and there are several other permanent watering points within approximately 1 km to the north, north-west (within the approved IPEE offset area) and to the south, south-east (within the proposed ID offset area). Further, seasonal or ephemeral waterways occur within the IPE offset area as well as approximately 1 km to the north, north-west and to the south, south-east. The extent to which these waterways provide permanent water availability is unclear; however, water was observed in the waterway to the south, south-east of the IPE

offset boundary during all survey events. Hence, the 172 ha offset area comprises both breeding and foraging habitat for the Squatter Pigeon.

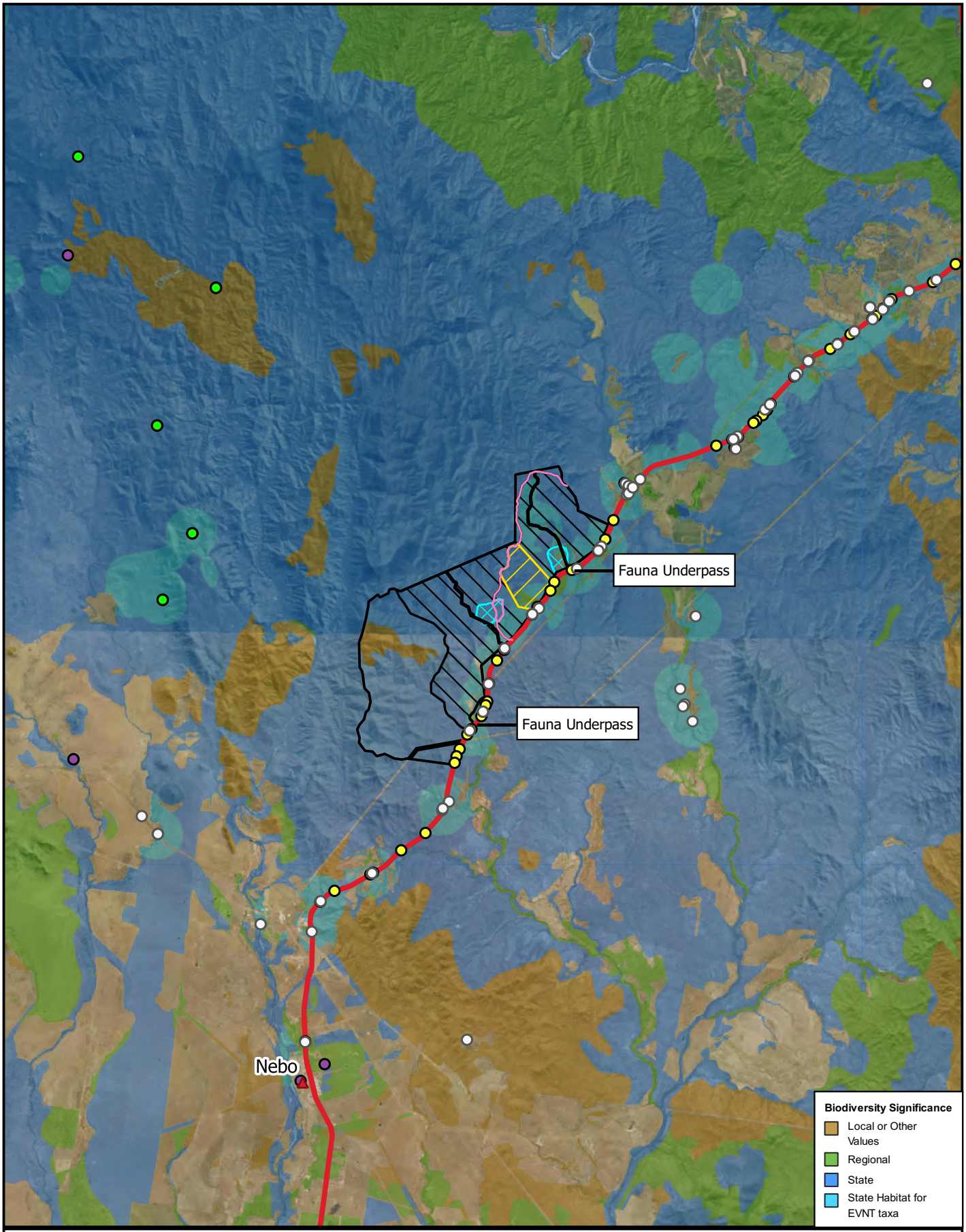
Based on the EPBC habitat definition, RE 11.12.1 and 11.3.4 are considered appropriate habitat as they support a rich and diverse understorey comprised primarily of grasses that are known to provide foraging habitat and are known to support Squatter Pigeons. The majority of the offset area is within 1 km of a semi-permanent water source (including artificial water sources) and numerous waterways and is therefore classed as breeding and foraging habitat (Figure 7). Further, Squatter Pigeons have been observed on several different occasions during all survey events undertaken to date inhabiting areas of landzone 12 and 3 (Figure 5). Of the 11 observations made of Squatter Pigeons during field surveys, four observations were in landzone 12.

The minimum offset area for the Squatter Pigeon is 172 ha and includes offsets for breeding and foraging habitat. Given the overlap between suitable habitat, Squatter Pigeon offsets can be collocated with offsets for the Koala and Greater Glider (Figure 6).

The Squatter Pigeon offset area had an average start habitat quality score of 4 out of 10 (Section 4.3). An increase in habitat quality for the Squatter Pigeon will be realised through strategic grazing aimed at managing understory cover and fuel loads, and targeted control of rabbits which will assist in increasing foraging habitat such as perennial grass cover. The Squatter Pigeon will also benefit from control of feral predators including Wild Dogs, Feral Cats and Foxes.

Key Threats

The primary threats to the Squatter Pigeon (southern) are ongoing habitat clearing, overgrazing of habitat by livestock and feral herbivores such as rabbits, thickening of understorey vegetation, and predation by invasive mammals such as cats and foxes (TSSC, 2015). Their habit of remaining stationary when disturbed makes them particularly vulnerable to predation and vehicle strikes. Other known threats include fragmentation of habitat, trampling of nests by domestic stock and feral herbivores, invasion of habitat by weeds such as *Cenchrus ciliaris* (Buffel Grass), drought, and bushfires (TSSC, 2015). Changes in hydrological regimes can also affect Squatter Pigeons by changing the distance between water sources and feeding habitat, affecting their movement through the landscape (Reis, 2012).



0 2 4 km

Scale @ A3: 1 : 200000
Date: 23/03/2021
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2021; QSPATIAL 2021; The State of Queensland (Department of Natural Resource and Mines) 2021;

Figure 4: Historical Fauna Records Within 20 Km of Lot 4SP277438

Legend

- Towns
- **ALA & Wildnet Records**
- Greater Glider
- ALA: Koala
- Squatter Pigeon
- DTMR: Koala Records
- Highways
- Existing Fenceline
- Lot 4SP277438 Boundary
- Offset Investigation Area
- Proposed IPE Offset Area
- Holding Yards

BASE/

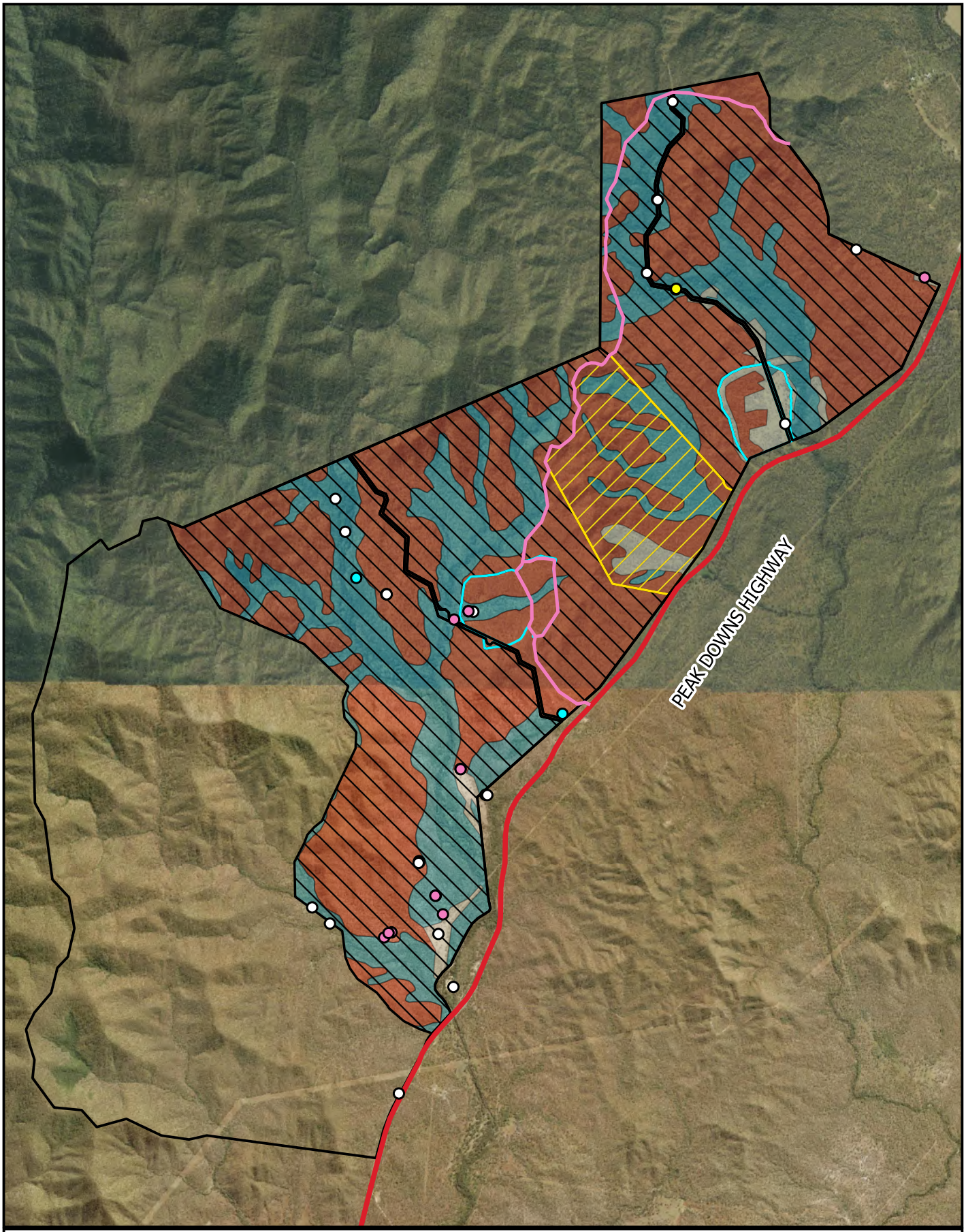


Figure 5: Species Occurance Within Lot 4SP277438

0 1 km

Scale @ A3: 1 : 55000
Date: 05/02/2021
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2021; QSPATIAL 2021; The State of Queensland (Department of Natural Resource and Mines) 2021;

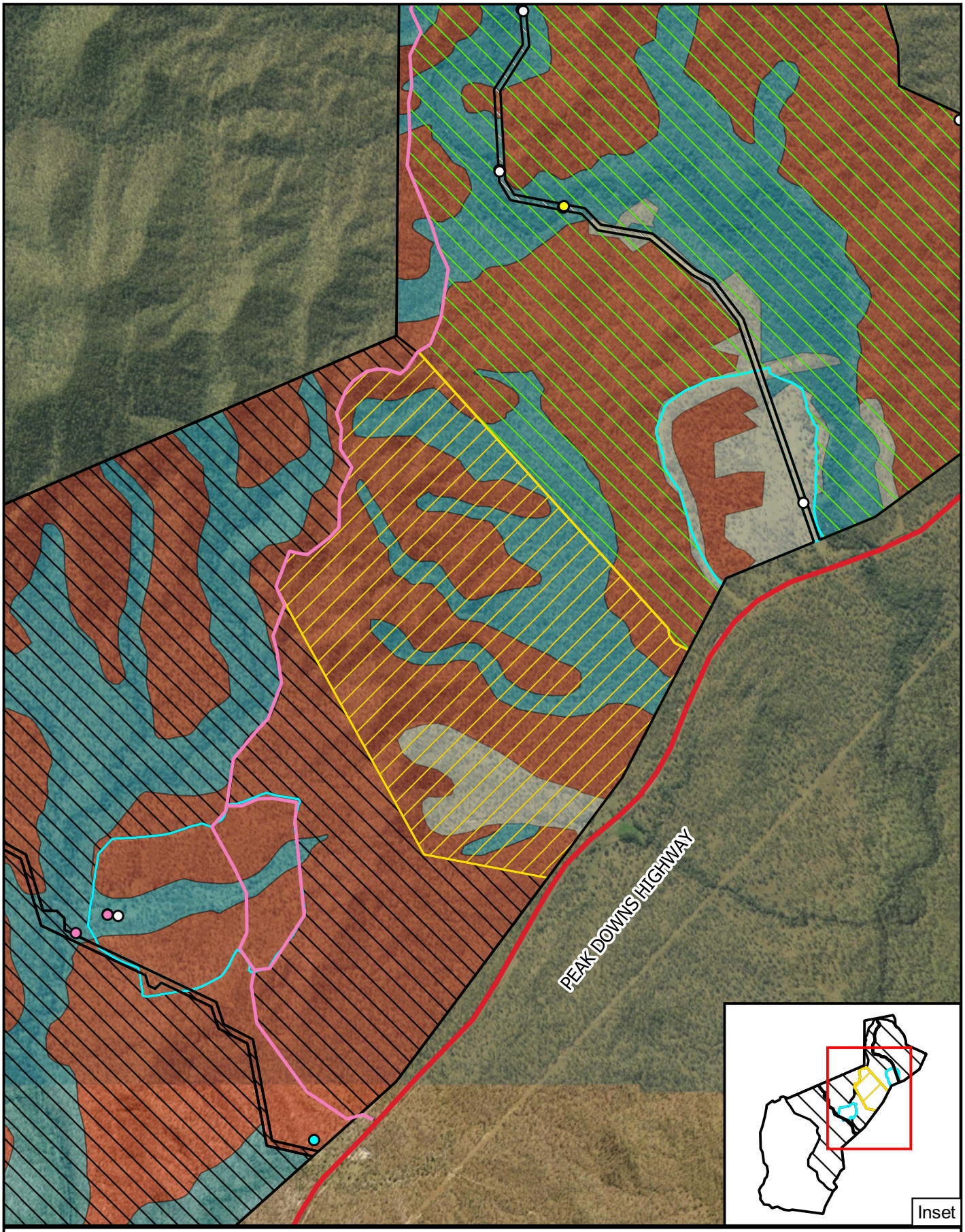
Legend

- Koala/Koala Scats
- Greater Glider
- Greater Glider (Unconfirmed)
- Squatter Pigeon
- Lot 4SP277438 Boundary
- Offset Investigation Area
- IPE Offset Area
- Holding Yards

Field Verified RE Mapping

- 11.12.1
- 11.3.4
- Non-Remnant

BASE/



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Scale @ A3: 1 : 25000
Date: 05/02/2021
Drawn: Josh T

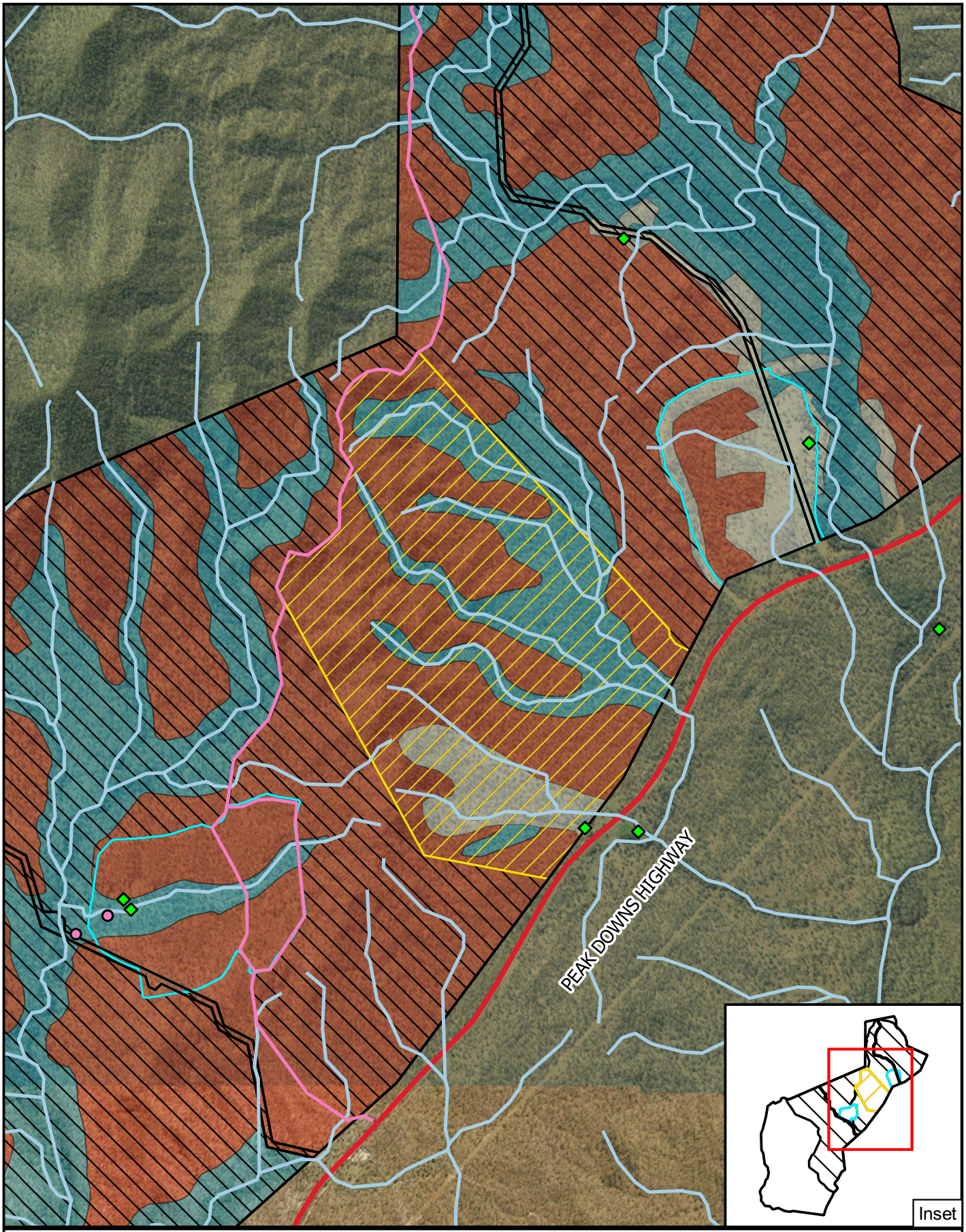
DATA SOURCE
BASE CONSULTING GROUP 2021; QSPATIAL 2021; The State of Queensland (Department of Natural Resource and Mines) 2021;

Figure 6: Koala and Greater Glider Habitat Within IPE Offset Area

Legend

- Koala/Koala Scat
- Greater Glider
- Greater Glider (Unconfirmed)
- Existing Fenceline
- Lot 4SP277438 Boundary
- Offset Investigation Area
- Koala and Greater Glider Habitat
- IPEE Offset Area
- Holding Yards
- RE: 11.12.1
- RE: 11.3.4 Non-Remnant

BASE/



0 200 400 600 m

Scale @ A3: 1 : 25000
Date: 23/03/2021
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2021; QSPATIAL 2021; The State of Queensland (Department of Natural Resource and Mines) 2021;

Figure 7: Squatter Pigeon Habitat Within IPE Offset Area

Legend

- Water Storage Points
- Squatter Pigeon
- Fenceline
- Watercourses
- Lot 4SP277438 Boundary
- Offset Investigation Area
- Squatter Pigeon Foraging and Breeding Habitat
- Holding Yards
- RE: 11.12.1
- RE: 11.3.4
- Non-Remnant

BASE/

4.0 Proposed Offsets

4.1 Habitat Quality Methodology and Scoring

As part of the Project's approvals process, detailed ecological assessments were undertaken to determine the presence/absence of listed fauna species within the Project (Impact) area and to assess and determine the level of residual impacts for listed species that had the potential to require offsets (EcoSM, 2020). Assessments for the purposes of determining habitat quality in accordance with version 1.2 of the Queensland's Department of the Environment and Science (DES) Guide to Determining Terrestrial Habitat Quality (the Guide) determined the impact area was restricted to ten (10) assessment units.

Ecological surveys undertaken for the initial IPE project included detailed habitat quality assessments in 2018 for Koala, Greater Glider and Squatter Pigeon which were included in the previous approved version of the IPE Offset Management Plan, which was approved by the then DoEE in October 2018.

Habitat quality for the impact and offset site was assessed using the Guide which, being based on the Queensland BioCondition survey methodology, uses a range of habitat indicators to measure the ecological viability and habitat values of a site and its capacity to support fauna. The process used for assessing habitat quality is designed so that it is repeatable and relatively simple and uses a combination of field attributes associated with vegetative structure, GIS assessment of the site in reference to its location in the landscape and species-specific habitat requirements.

As stated in the Guide, the assessment must measure habitat quality at the impact site and the offset site in order to quantify and compare the scores. Each of the three indicators are scored then summed to derive a final score out of 10 (refer to the Guide for calculation methodology). The key indicators for determining habitat quality of a land-based impact site or an offset site are:

- Site condition: a general condition assessment of vegetation compared to a benchmark site;
- Site context: an analysis of the site in relation to the surrounding environment; and
- Species habitat index: the ability of the site to support a given species.

Habitat quality of the impact and offset sites for the purposes of providing inputs into the EPBC offsets calculator were calculated following advice from the-then DoEE (now DAWE) during July 2018. To assess habitat quality, the majority of the attributes from the three indicators were used but partitioned differently with the majority of the species habitat index attributes being partitioned between site condition and site context as follows.

- Site Condition (15 attributes):
    - Recruitment of woody perennial species in EDL
    - Native plant species richness - trees
    - Native plant species richness - shrubs
    - Native plant species richness - grasses
    - Native plant species richness - forbs
    - Tree canopy height
    - Tree canopy cover
    - Shrub canopy cover
    - Native perennial grass cover

    - Organic litter
    - Large trees
    - Coarse woody debris
    - Non-native plant cover
    - Quality and availability of food and foraging habitat
    - Quality and availability of shelter
- Site Context (7 attributes):
    - Size of patch
    - Connectedness
    - Context
    - Ecological Corridors
    - Threat to Species
    - Species mobility capacity
    - Role of site location to overall population

Species stocking rate as outlined in the EPBC offsets calculator guide, replaces species habitat index as a measure of the presence of a species at the impact and offset site. As directed by then DoEE (now DAWE), species stocking rate for this OMP is to be assessed on a scale of 0 - 4 as categorised below:

- 0: No evidence the species is present at the site;
- 1: Evidence of species presence at the site during surveys conducted for the purpose of the EPBC environmental assessment;
- 2: There is a statistically significant increase in species density relative to the species density determined for a score of 1 or species density is equal to or greater than the species density at a reference site (not required to be an important population);
- 3: Equivalent to the species density at a reference site associated with an important population; and
- 4: Equivalent to the maximum species density measured at a DAWE agreed number of reference sites associated with important populations.

To achieve an overall habitat quality score out of 10, site condition and site context are multiplied by a weighting factor out of 10 based on the level of importance attributed to site condition, site context and stocking rate for the MNES in question. The DAWE determined the weighting factors for these MNES will be 30% for site condition, 30% for site context and 40% for species stocking rate.

4.2 Impact Area Assessments

Habitat quality scores for the impact area were determined from surveys undertaken in March 2018 from nine survey sites within the five assessment units and in accordance with the methods outlined in the Guide[1]. These surveys were undertaken specifically to

[1] Note. The impact area habitat quality surveys were undertaken in accordance with the methods outlined in version 1.2 (April 2017) of the Guide. As outlined in the version 1.3 (February 2020), if a previous version of the Guide was used to undertake a baseline assessment for an impact or offset site, the same version of the methodology must be used for all subsequent assessments.

determine habitat quality of the impact site for input into the EPBC offsets calculator. Habitat quality scores as outlined in the previously approved OMP, were calculated for the Koala, Greater Glider and Squatter Pigeon from the March 2018 surveys and are provided in the impact area ecology report provided in Appendix B. These scores remain unchanged to that provided in the previously approved IPE OMP with the exception that the stocking rate for the Greater Glider in the impact area was increased to a one (1) from a zero (0). Scores were based on survey site data that corresponded to the species-specific habitats to be impacted as outlined in the ecological report prepared for the EPBC referral and State approvals. Where multiple survey sites occurred within an assessment unit, the corresponding habitat quality score was derived from averaging site condition and site context from the survey sites. The average scores were then summed and divided by the corresponding maximum possible scores.

Site condition and site context were determined for each offset matter using data collected from only those habitats that were deemed as being suitable during the ecological assessments undertaken to support the approvals process. Stocking rate was determined based on the outcomes of the ecological surveys and the presence of MNES. The IPE site condition and site context scores that were used to derive the impact area habitat quality scores for the Koala, Greater Glider and Squatter Pigeon are outlined in Table 5.

Table 5 Impact area habitat quality scores and habitat descriptions for the Koala

Offset Attribute	Value	Description
Habitat Quality	**3/10** (rounded up from 2.9)	**Site Condition = 1.8** **(raw score = 5.9 multiplied by 30% weighting).** The wider impact area is fragmented and degraded through previous habitat clearing. Ground-truthing confirmed that only approximately 40% of the Project area is mapped as remnant vegetation and regrowth vegetation and the current RE mapping is largely correct and consists of nine remnant REs and two regrowth REs. Habitat quality of potential Koala habitat showed the structural complexity of vegetation is relatively good with multiple vegetation layers being present. This habitat consists of a moderately intact canopy layer (ranging from 5-47 %) of medium sized trees with canopy heights ranging from 12-20 m high. In general, there was a low abundance of large *Eucalyptus* trees over 40 cm diameter at breast height (dbh) with values ranging from one (1) tree per ha to a maximum of nine (9) per ha. The surveys showed varying structural complexity compared with benchmark (undisturbed) sites with higher species richness of shrubs, grasses and forbs compared with benchmark sites. Compared to benchmark, the impact area was also characterised by higher levels of organic litter and non-native plant cover, but lower levels of native grass cover, coarse woody debris and native plant species richness. Although the impact site currently has moderate recruitment levels, the abundance of large trees is limited. Nevertheless, foraging and shelter tree species are present, and the remaining vegetation is of moderate quality **Site Context = 1.1** **(raw score = 3.8 multiplied by 30% weighting).** DES Biodiversity Planning Assessments (BPA) mapping indicates that some areas in the north of the impact area are classified as being of State Biodiversity Significance. The impact area contributes to a regional landscape of moderate to high habitat fragmentation with intermittently connected local tracts of remnant vegetation near to larger State Biodiversity Corridors (e.g. the Isaac River to the south-west of the Project area). Due to absence of Koalas within the impact area and the availability of Koala trees within the wider area, the clearing of Koala habitat is unlikely to critically impact the occurrence of the species within the region.

Offset Attribute	Value	Description
		Species Stocking Rate = 0. Koalas were not found within the impact area; however, Koala habitat was confirmed as occurring. A stocking rate of 0 was chosen as no evidence of Koalas occurring within the impact area were found during the ecological assessments (EcoSM, 2020).

Table 6 Impact area habitat quality scores and habitat descriptions for the Greater Glider

Offset Attribute	Value	Description
Habitat Quality	**4/10** (rounded up from 3.8)	**Site Condition = 1.8 (raw score = 5.8 multiplied by 30% weighting).** In general, the structural complexity of vegetation is relatively good with multiple vegetation layers and leaf litter. This habitat consists of an intact canopy layer (average 47 %) of medium sized trees with canopy heights ranging from 14-15 m high. In general, there was a low abundance of large Eucalypt trees over 41 cm diameter at breast height (dbh) with values ranging from one (1) tree per ha to a maximum of seven (7) per ha with a similar pattern for large non-Eucalypt species ranging from 2-4 trees per ha. Surveys showed varying structural complexity compared with benchmark (undisturbed) sites with higher species richness of native tree species, shrubs, grasses and forbs compared with benchmark sites. The impact area was also characterised by higher levels of organic litter and non-native plant cover, but lower levels of coarse woody debris and lower native grass cover. The Greater Glider was found within the riparian corridors of Smoky Creek and Billy's Gully within RE 11.3.25. These corridors provide moderate levels of foraging and shelter habitat where the abundance of large old hollow bearing trees and the diversity of Eucalypt species are the greatest. **Site Context = 1.0 (raw score = 3.5 multiplied by 30% weighting).** Suitable habitat for the Greater Glider was largely restricted to narrow riparian corridors with limited connectivity. However, the riparian corridor associated with Smoky Creek does form part of a narrow corridor of State Biodiversity Significance. Although these habitats provide some ecological benefit, they are unlikely to support a large population of Greater Gliders and are not considered to critically impact the occurrence of the species within the region when considered in the context of habitat availability in the wider region. **Species Stocking Rate = 1.0** The Greater Glider was found within the riparian corridors of Smoky Creek and Billy's Gully within RE 11.3.25 which comprised 2.8 ha of the total impact area. As such, the Greater Glider was given a species stocking rate score of 1 and was allocated a weighting of 40%.

Table 7 Impact area habitat quality scores and habitat descriptions for the Squatter Pigeon

Offset Attribute	Value	Description
Habitat Quality	**4/10** (rounded down from 4.3)	**Site Condition = 1.8 (raw score = 6.0 multiplied by 30% weighting).** Squatter Pigeons occurred in both remnant and non-remnant vegetation with site condition surveys sites in RE 11.3.25, RE 11.5.3 and RE 11.5.12. Compared to benchmark sites, the survey sites were, in general, similar and with relatively good structural complexity These habitats consisted of a moderately intact canopy layer (ranging from 20-48 %) of medium sized trees with canopy heights ranging from 14-20 m high. The understory consisted of similar grass species richness compared to benchmark, considerably lower cover of native grasses and generally higher organic litter cover and non-native plant cover. The presence of Squatter Pigeons in the area is mainly due to their broad habitat requirements and the presence of grasslands which provide abundant food resources. **Site Context = 1.5 (raw score = 5.1 multiplied by 30% weighting).** The impact area was within the fragmented Northern Bowen Basin Subregion of the Brigalow Belt. The habitats that are most suitable for the Squatter Pigeon, namely RE 11.3.25, RE 11.5.3 and RE 11.5.12 correspond to vegetation patches that are either larger in size or have greater connectivity to adjacent vegetation patches relative to other vegetation communities within the Project area. As Squatter Pigeons can occupy non-remnant vegetation habitats as well as remnant, site context is less restricted relative to the Koala and Greater Glider. However, threats to Squatter Pigeons are considerable due to the presence of known predators including feral cats and foxes. Due to the large areas of suitable habitat elsewhere within the area and the mobility of Squatter Pigeons, the approved clearing is not considered to critically impact the occurrence of the species within the region. **Species Stocking Rate = 1.** Squatter Pigeons were observed throughout the impact and wider Project area as was expected based on their habitat requirements and their ubiquitousness in the wider area. Therefore, the Squatter Pigeon was given a species stocking score of 1.

4.3 Overview of Offset Property and Offset Area

The identified 290 ha offset area is in the mid-northern area of Lot 4SP277438 within the Mt Spencer Station property (Figure 1 and Figure 3). Lot 4SP277438 encompasses 4,810 ha of which 4,693 ha is currently mapped as remnant vegetation that has the potential to provide offsets for impacts to the MNES. Further, Mt Spencer Station (inclusive of Lot 4) covers 22,712 ha which includes approximately 20,190 ha of remnant vegetation that has the potential to provide offsets for impacts to the MNES.

Mt Spencer Station is a beef cattle and cropping property located between the Brigalow Belt (the IPE offset area) and Central Queensland Coast (small sections to the north-west of the offset area) bioregions straddling the Clarke-Connors ranges (in the western section) and the Nebo-Connors Ranges (in the eastern section). The Clarke-Connors Ranges sub-region is currently classified as an intact landscape which reflect the minimal levels of habitat fragmentation that have occurred relative to other bioregions in Queensland. However, the Nebo-Connors Ranges sub-region in contrast is currently classified as a fragmented landscape which generally reflects higher levels of historic disturbance and habitat fragmentation. Vegetation surveys undertaken in July and October 2020 determined the on-ground vegetation communities do not vary either side of the bioregion boundary and as

such, the RE vegetation community that accurately matched the on-ground vegetation (11.3.4 and 11.12.1) was used for the purposes of remapping the vegetation and calculating the habitat quality scores.

The Biodiversity Planning Assessment (BPA) mapping shows the majority of Mt Spencer Station has been mapped as containing areas of State Significance (i.e. areas of State significance due to the presence of endangered, vulnerable and/or near threatened taxa (refer to Figure 4). In particular, the eastern area of the IPE offset area is State Habitat for endangered, vulnerable and near threatened species. Linear areas along the Peak Downs Highway (which bisects the whole of Mt Spencer Station) also includes areas of State and Regional Habitat for Endangered, Vulnerable and Near Threatened (EVNT) fauna. This area also corresponds to areas mapped as Essential Habitat.

The eastern boundary of the investigation area is bordered by non-remnant vegetation characterised by the Peak Downs Highway (although remnant vegetation occurs on the eastern side of the Highway and connectivity occurs via road underpasses). The remaining northern, western, and southern boundaries are bordered by large tracts of remnant vegetation that include protected areas such as the Epsom State Forest and Homevale National Park (Figure 3). The IPE offset area is completely bordered by the Epsom State Forest to the west. Discussions with the landowner revealed the cadastre boundary with the adjoining Epsom State Forest is not fenced exactly along the cadastral boundary line and fence line boundaries have been used to delineate the offset area within the Lot 4 boundary, rather than the cadastral boundary with the State Forest. When calculating the IPE offset area, this fence line was used rather than the cadastre boundary.

4.3.1 Offset Area Habitat Quality

The proposed 290 ha offset area contains suitable habitat and environmental values to offset the required impacts to the Koala, Greater Glider and Squatter Pigeon and was chosen such that all required offsets for the three MNES could be co-located within the one offset area. Three field investigations were undertaken in June, July and October 2020 (Refer to Appendix C for the ecological survey report). The June event was primarily a general reconnaissance survey to assess where the most suitable offset areas occurred within Lot 4. Opportunistic fauna observations were also recorded, and sightings of the Koala and Squatter were observed while suitable Greater Glider habitat and tree hollows were noted.

The July and October 2020 surveys were targeted towards confirming the presence of all three species as well as collecting habitat quality data. As the July survey did not detect the Greater Glider within the offset investigation area, DAWE suggested a further survey should be undertaken to target this species. This targeted survey was undertaken in October and the ecologists took opportunity to collect further habitat quality data and to confirm the boundaries of the remapped REs.

The July and October surveys confirmed the broader offset investigation area comprises a Eucalypt Woodland BVG that is dominated by vegetation consistent with REs 11.12.1 and 11.3.4 and interspersed with small and isolated non-remnant patches. These vegetation communities are considered appropriate for Koala as these REs support known Koala food trees, Greater Glider habitat and Squatter Pigeon breeding and foraging habitat. The proposed offset site is shown in Figure 3-7. As outlined above, the IPE offset area straddles both Bioregion 11 and Bioregion 8, but the offset area is dominated by Bioregion 11 (approximately 90% of the area is in Bioregion 11 – Brigalow Belt). The on-ground vegetation communities and REs were the same in either side of the Bioregion boundary and as such, the RE description that most closely matched the on-ground vegetation communities (RE 11.12.1 and RE 11.3.4) were used as benchmark REs for calculating the habitat quality scores.

The July and October 2020 field assessments determined the baseline habitat quality of the offset area in accordance with the Guide and assessed the species stocking rate (presence)

of the Koala, Greater Glider, and Squatter Pigeon. Habitat quality of the offset area was determined in accordance with the methods outlined in Section 4.1 and in the same manner for the impact site as directed by the-then DoEE (now DAWE).

A total of 31 habitat quality plots were used to determine habitat quality within the broader strategic offset area. The intent of the broader offset area was to provide offsets for all three of Stanmore's projects (IPE, IPEE and ID). The broader strategic offset area was subdivided for each offset area based on order of importance of submitting an OAMP for approval and construction schedules. This necessitated the IPEE OAMP to be developed first and the IPE offset area second, as shown on Figure 6 and Figure 7. The IPEE offset area is in the northern section of Lot 4. The IPE offset area is located immediately to the south, south-west of and bordering the IPEE offset area (Figure 6 and Figure 7Figure 3).

The most practical offset boundary for the IPE offset area is shown in this OMP. Due to the constraints associated with determining the offset boundary, only seven (7) habitat quality plots occur within the IPE offset area, rather than the recommended nine (9). Data from seven (7) habitat quality plots were used to determine the starting habitat quality of the IPE offset site and to assess the management actions required to achieve an ecological gain within the offset site. The number of habitat quality plots within each of the assessment units is shown in Table 8.

Combined, the IPEE (15 plots) and IPE (7 plots) offsets areas included 22 of the 31 habitat quality survey plots with the number of survey plots within the boundary of the offset areas being dictated by the configuration of the offset area boundaries which were determined through consultation with the landowners. Habitat quality scores for both the IPEE and IPE areas were very similar with any minor differences being driven by species stocking rate rather than site condition or site context. Additional sampling sites for ongoing monitoring will be established during the detailed monitoring undertaken in year 1 as outlined in 8.3.

Table 8 Assessment units and corresponding count of habitat quality plots

Assessment unit	RE	Area of RE (ha)	Number of HQPs
AU1	11.12.1	175	3
AU2	11.3.4	86	2
AU3	Non-remnant (11.3.4)	29	2
Total		**290**	**7**

Habitat quality score metrics for each of the MNES are summarised in Table 9. Offset area habitat quality descriptions are provided in Table 11 to 13 for the Koala, Greater Glider and Squatter Pigeon, respectively.

Representative photos of the offset investigation area are shown in Plates 1-2.

Plate 1 Representative photo from AU1 (RE 11.12.1) within the offset site

Plate 2 Representative photo of riparian vegetation within the offset site from AU2.

Table 9 Summary of habitat quality of the offset site to be secured on Mount Spencer Station

MNES	Site condition[2]	Site context[3]	Species stocking rate[4]	Starting habitat quality score (HBS)[5]	AU area weighted HBS
Koala *(Phascolarctos cinereus)*	2.2	1.5	0	4/10 (rounded up from 3.6)	4/10 (rounded up from 3.8)
Greater Glider *(Petauroides volans)*	2.2	1.9	0	4/10 (rounded down from 4.1)	4/10 (rounded down from 4.2)
Squatter Pigeon (Southern) *(Geophaps scripta scripta)*	2.2	1.8	0	4/10 (no rounding required)	4/10 (rounded down from 4.1)

4.3.2 EPBC Offset Area Calculator Attributes

In accordance with the EPBC Act Environmental Offsets Policy, the results of the field survey and calculation of habitat quality as outlined in Section 4.1, were used to provide inputs into the EPBC Offset Assessment Guide calculator to determine the offset area required and the percent of impact that could be offset within the proposed offset area for each of the MNES. Based on the results of these analyses, Table 10 outlines the impact areas of the Project, the offset area required to be secured, the habitat quality score as calculated using the methods outlined in Section 4.1 and the percent of the impact that is offset. The habitat quality scores of the impact site are included in the impact area ecology report in Appendix B and in Appendix D for the offset area.

The input values used for the calculation are provided below and reflect a realistic assessment of the area to provide offsets into the future as well as the likely future habitat quality in the absence of offsets. The EPBC Offset Assessment Guide calculator results indicate that the proposed 290 ha offset area will fully meet offset requirements for the Koala, Greater Glider and Squatter Pigeon. Although the offsets area is completely encompassed by remnant vegetation and habitat suitable for the MNES, the area also includes several threatening processes that is limiting the habitat values of the area for those MNES.

Table 11, Table 12 and Table 13 provide descriptions of the input values for each MNES and the output worksheets from the EPBC Offset Assessment Guide calculator are included in Appendix E. Table 14 summarises separately the risk of loss, confidence and time to ecological benefit for the offset area as these attributes are consistent for all three MNES.

Table 10 Summary of the offset area to be secured on Mount Spencer Station

Offset Matter	Impact area (ha)	Offset area (ha)	Baseline habitat quality score	Future habitat quality with management	Percent acquitted
Koala	125	217	4/10	6/10	100.08
Greater Glider	125	290	4/10	6/10	100.31

[2] Average from all three assessment units after applying DAWEs weighting of 30%
[3] Average from all three assessment units after applying DAWEs weighting of 30%
[4] Average from all three assessment units after applying DAWEs weighting of 40%
[5] Weighted habitat quality score as calculated from the DAWE modified QLD habitat Quality Spreadsheet

Offset Matter	Impact area (ha)	Offset area (ha)	Baseline habitat quality score	Future habitat quality with management	Percent acquitted
Squatter Pigeon	74	172	4/10	6/10	100.50

Table 11 Species specific habitat quality offsets calculator metrics and habitat details for the Koala offset area

Offset Calculator Input	Score	Comment
Quality of impact area	3	Although the Koala was not confirmed as present within the impact area, Koala habitat was confirmed as present. The overall habitat quality of the impact area is somewhat limited due to past processes such as habitat clearing, grazing, fire and disturbance by feral animals and weed species. The impact area does support a moderate abundance of foraging habitat for the Koala which was observed primarily along Smoky Creek and Billy's Gully. As all Eucalypt trees are considered Koala habitat, the full clearing extent of 207.8 ha is considered to impact Koala habitat. The quality of the impact area was assessed in accordance with the Guide and the methods outlined in Section 4.1 which identified a habitat quality score of 2.9/10.
Starting quality of offset area	4	The offset area (217 ha) is dominated RE 11.12.1 and 11.3.4. These Eucalypt dominated REs are considered suitable habitat for the Koala as they support known or potential habitat trees required for shelter and foraging. Although evidence of recruitment of canopy trees was observed in the offset area, this did not equate to establishment of large canopy trees which showed low abundance relative to the impact area and benchmark sites. Therefore, the offset site has a lower level of foraging and shelter habitat relative to both the impact area and benchmark. The offset area is currently used for livestock grazing and has moderate levels of disturbance caused by feral animals, past fire practices and incursion by invasive weed containing species known to occur within 11.3.4 including Lantana, Rubber Vine and Parthenium. Combined, these threatening processes result in a habitat that is moderately degraded with low-moderate levels of floristic diversity within the ground mid-story layers. The quality of the Koala offset area was assessed in accordance with the Guide and the methods outlined in Section 4.1 which and identified a habitat quality score of 4/10.
Future quality of the offset area without offset management	4	An assessment of the likely habitat quality of the offset area was undertaken and considered the current habitat quality as determined by and assessed in accordance with, the DES Guide, the threatening processes to the Koala and the effect of these processes on the future habitat quality. In addition, Queensland's *Planning Act 2016* (PA Act) includes a range of exemptions for landholders to manage vegetation including establishing new infrastructure, fences, roads, tracks, fire management lines and firebreaks. Approval to thin vegetation can also be sought. The implementation of these actions will not result in the entire removal of vegetation; however, coupled with cattle stocking rates has the potential to degrade woodland habitats, such as a further reduction in habitat quality associated with the ground and mid-canopy layers.

Offset Calculator Input	Score	Comment
		The current processes and the presence of known invasive weeds of State and National significance, particularly Lantana would continue to have a detrimental impact on tree species recruitment (and establishment), and native plant habitat quality via a decrease in species richness for grasses, shrubs, and forbs, a decrease in native grass cover and an increase in non-native plant cover. Specifically, the offset area was found to contain a variety of WONS including Rubber Vine, Lantana, Velvety tree pear and Parthenium (within the offset Ecology Report in Appendix C). These species are highly invasive and coupled with habitat degradation by feral animals including Feral Pigs, Feral Horses and Rabbits may create heightened conditions for the spread and establishment of these invasive weeds. Associated impacts are likely to include increased erosion which can lead to a further habitat disturbance. These processes and land management actions, whilst primarily on the ground and mid-storey floristic structural layers, have the potential to degrade the quality and availability of food and foraging habitat for the Koala and an increased threat to Koalas from predators accessing the area. The current threats from traffic related deaths along the Peak Downs Highway are likely to continue to be a risk to the species. However, DTMR have recently installed Koala fencing at along sections of the Peak Downs Highway that border Mt Spencer. If this fencing is successful in funnelling Koalas under the Peak Downs Highway, threats from traffic related deaths may decrease. Taking into consideration the above threatening processes, the predicted effects of these processes, current management practices and obligations on all landowners under Queensland biosecurity legislation to appropriately control invasive weeds and pest animals, no decrease in habitat quality is anticipated for the offset site without the offset being in place.
Future quality of the offset area with offset management	6	The quality of Koala habitat will be improved and maintained through the establishment of the proposed offset area. Future quality of the offset represents the ecological gain that can be achieved over 20 years of active land management aimed at improving the ecological condition of habitat specifically for the species. Detailed management actions are outlined in Section 6.0 and are specifically targeted towards providing enhanced habitat values for the Koala. The management actions will reduce pest animal abundance, increase flora species richness, enhance recruitment of large canopy trees, and increase quality of food and shelter habitat, encouraging Koalas to inhabit the area. Management actions include: • A pest management control program to reduce the number of pest animals, including Feral Pigs and Rabbits which may degrade the area, constraining vegetation recruitment and prompting weed infestations; and Wild Dogs, Foxes and Feral Cats which can prey on Koalas as they move between habitat trees and disperse Koalas;

Offset Calculator Input	Score	Comment
		• Strategic cattle grazing management to improve the condition of habitat through improved tree recruitment, reduce weed infestations and excessive ground cover; • Weed management to reduce the infestation of weeds that currently out-compete native tree species; and • Fire management to maximise recruitment and establishment of large canopy trees and increase canopy cover. Maximising the establishment of canopy trees will increase foraging habitat, and increasing tree canopy and sub-canopy cover will provide additional shelter habitat. Fire management will be a key management action. Properly managed fire regimes will promote cooler fires and avoid hot and intense fires which are known to destroy fauna habitat, including shelter and food resources. Removing and controlling Lantana will also minimise the potential for hot fires as significant stands of Lantana occur along the riparian and surrounding vegetation, and these stands promote fire to funnel up to the tree canopies.

Table 12 Species specific habitat quality offsets calculator metrics and habitat details for the Greater Glider offset area

Offset Calculator Input	Score	Comment
Quality of impact area	4	The Greater Glider was confirmed as present within riparian corridors adjacent to the impact area. The overall habitat quality of the impact area is somewhat limited due to the habitat of the Greater Glider being primarily restricted to the riparian vegetation and the levels of habitat fragmentation as well past processes such as grazing and disturbance by feral animals and weed species. The impact area generally has lower levels of habitat connectivity compared to intact landscapes and lower densities of large hollow bearing trees which provide shelter and nesting habitat for the Greater Glider. The quality of impact area was assessed using the Guide and the methods outlined in Section 4.1 which identified a habitat quality score of 3.8/10.
Starting quality of offset area	4	The offset area for the Greater Glider (290 ha) will be collocated entirely within the Koala offset area. The offset area occurs within the single mixed RE polygon dominated by RE 11.12.1 and RE 11.3.4 and habitat quality scores were derived from the methods outlined in the DES Guide. These Eucalypt dominated REs are considered suitable habitat for the Greater Glider. The 11.3.4 vegetation community is considered important drought refuge and wildlife corridors for arboreal animals and 11.12.1 can provide important nesting habitat for arboreal animals via the general prevalence of tree hollows. Although evidence of recruitment of canopy trees was observed in the offset area, this did not equate to an abundance of large canopy trees which have the greatest potential to provide shelter and nesting habitat for Greater Gliders. In both 11.3.4 and 11.12.1, the number of large canopy trees was only 52% and 34% of Benchmark REs, respectively. In addition, within RE 11.12.1, the majority of vegetation attributes exhibited lower habitat quality scores compared to Benchmark. Habitat quality scores from RE 11.3.4 were variable with some attributes considerably higher than Benchmark values and others lower. The offset area is currently used for livestock grazing and has moderate levels of disturbance caused by feral animals and incursion by invasive weed species, particularly Lantana. Combined, these threatening processes result in a habitat that is moderately degraded with restricted habitat values at present. The quality of habitat within the Greater Glider offset area was 4/10.
Future quality of the offset area without offset management	4	Future habitat quality without an offset in place was assessed by taking into consideration the current habitat quality, the current threatening processes and the effect of these processes on the habitat quality scores as determined by the accepted habitat quality scoring process outlined in the DES Guide. Queensland's *Planning Act 2016* (PA Act) includes a range of exemptions for landholders to manage vegetation including establishing new infrastructure, fences, roads, tracks, fire management lines and firebreaks. Approval to thin vegetation can also be sought. The implementation of these actions will not result in the entire removal of vegetation; however, coupled with cattle stocking rates has the potential to degrade woodland

Offset Calculator Input	Score	Comment
		habitats, such as a further reduction in habitat quality associated with the ground and mid-canopy layers. The main threatening process that are contributing the habitat quality of the site are the loss and degradation of foraging and shelter/nesting habitat by feral animals, fire regimes and the presence of known invasive weeds of State and National significance. These processes would continue to have a detrimental impact on several site condition attributes including decreasing tree species recruitment (and establishment), decrease in species richness of grasses, shrubs, and forbs, a decrease in native grass cover and an increase in non-native plant cover. The project area was found to contain a variety of WONS including Rubber Vine, Velvety tree pear and Lantana. These species are highly invasive and coupled with habitat degradation by feral animals including Feral Pigs and Rabbits is expected to exacerbate the spread and establishment of these invasive weeds. Associated impacts may include increased erosion which can lead to further habitat disturbance. Over an extended period, this would lead to a decrease in sub-canopy and canopy floristics and abundance and in turn, limit the potential for nesting and foraging habitat. These processes, whilst primarily restricted to the ground and mid-storey floristic layers, may degrade the quality and availability of food and foraging habitat and an increased threat from predators accessing the area. In addition, these processes would likely lead to hotter and more intense fires which could prevent the offset site from increasing in habitat quality. Further degradation to the 11.12.1 vegetation (which can provide important nesting habitat for arboreal animals via the general prevalence of tree hollows) would decrease the ecological values of the area. Taking into consideration the above threatening processes the predicted effects of these processes, current management practices and obligations on all landowners under Queensland biosecurity legislation to appropriately control invasive weeds and pest animals, no decrease in habitat quality is anticipated for the offset site without the offset being in place.
Future quality of the offset area with offset management	6	The quality of the Greater Glider habitat will be improved and maintained through the establishment of the proposed offset area. Future quality of the offset represents the ecological gain that can be achieved over 20 years of active land management practices to improve the ecological condition of habitat for the species. It has been conservatively calculated that by implementing the detailed management actions outlined in Section 6.0 of this OMP, the habitat quality score can increase from 4/10 to 6/10 (an increase in habitat quality of 1 and an increase in species stocking rate of 1). The management actions are aimed at increasing canopy tree recruitment and minimising disturbance such that the presence of tree hollows and shelter habitat can be established. In addition, artificial tree hollows will be installed and maintained at a rate of one (1) for every 10 ha (or as determined by a suitably qualified ecologist) in order to achieve an increase in habitat quality. The nest boxes will be installed within the 290

Offset Calculator Input	Score	Comment
		ha offset area and primarily within RE 11.3.4 but also within an approximate 100 m buffer in the adjacent RE 11.12.1. Further, the size, configuration, location and spatial configuration of nest boxes will be undertaken in accordance with expert advice and preliminary discussions have been held with Associate Professor Ross Goldingay (Southern Cross University) with regard to these matters. Management actions include: • A pest management control program to reduce and the number pest animals, including Feral Pigs, Feral Horses and Rabbits that are currently degrading the area, constraining vegetation recruitment and prompting weed infestations, and Foxes, Feral Cats and Wild Dogs which are known predators of the MNES. Feral cats were observed traversing the offset area during spotlighting and on one occasion, a Feral Cat was seen adjacent to a tree hollow with the observed behaviour consistent with predatory behaviour; • Strategic cattle grazing management to improve the condition of habitat through improved tree recruitment and reduced weed infestations and excessive ground cover; • Weed management to reduce the infestation of weeds that currently out-compete native tree species; and • Fire management to maximise recruitment, allow mid to upper storey habitat trees to mature and promote the establishment of tree hollows. Using appropriate fire regimes will also minimise the incidence of hot and damaging fires which would likely destroy existing hollow bearing trees and retard the establishment of new hollows. Maximising the establishment of hollow bearing trees will provide denning habitat opportunities and increased tree canopy and sub-canopy cover will provide additional habitat for the Greater Glider. Implementation of this OMP is expected to increase habitat quality over the 20 year period from 4/10 to 6/10.

Table 13 Species specific habitat quality offsets calculator metrics and habitat details for the Squatter Pigeon offset area

Offset Calculator Input	Score	Comment
Quality of impact area	4	Extensive areas of habitat for the Squatter Pigeon were present throughout the Project area. Habitat was in moderate condition with impacted areas of Eucalypt Woodlands on land zones 3 and 5 including (RE 11.3.25, RE 11.5.3 and RE, 11.5.12) that were generally within 1 km of a permanent water offering the highest value habitat for the Squatter Pigeon (breeding habitat). Although the impact area was fragmented, and threatening processes were observed, the relatively broad habitat utilised by Squatter Pigeons resulted in a habitat quality score of 4.3/10.
Starting quality of offset area	4	The offset area for the Squatter Pigeon is 172 ha. This offset area occurs will include offsets for the Koala and Greater Glider as shown on Figures 6 and 7. Eucalypt dominated REs are considered suitable habitat for the Squatter Pigeon as they are within an area of known Squatter Pigeon records, are consistent with the foraging and breeding habitat definitions included on the SPRAT profile and varied EPBC approval conditions and they support a rich and diverse grassy understorey within an area of known Squatter Pigeon records. In addition, all of the offset area is within 1 km of waterways and permanent water sources including artificial stock watering points. On a number of occasions including the RE groundtruthing survey event in June 2020 and the detailed ecological survey events in July 2020, Squatter Pigeons were found in a range of habitat types including RE 11.12.1 and varying level of groundcover. Within the offset area, landzone 12 primarily consists of soils and geology that is deeply weathered. This is similar to that found on landzone seven (7) and landzone five (5) and is consistent with known Squatter Pigeon foraging and breeding habitat. As such, this habitat is considered suitable Squatter Pigeon habitat based on the observations made over two different sampling events, as well as confirmed sightings over many years by the landowners, and taking into consideration the topography, soils, geology and understorey microhabitats. The offset area is currently used for livestock grazing and has moderate levels of disturbance caused by feral animals (Feral Pigs and Rabbits), past fire practices and incursion by weed species. Combined, these threatening processes result in an altered understorey habitat that is moderately degraded with restricted habitat values at present. The quality of habitat within the offset area was 4.0/10.
Future quality of the offset area without offset management	4	The main threatening processes are the loss and degradation of the ground layer (grasses, forbs) which directly impacts the Squatter Pigeon by degrading their preferred foraging and breeding/nesting habitat. Habitat degradation is occurring through feral animals, fires and the presence of invasive weeds of State and National significance. These processes, without being controlled by the landowner, would have a detrimental impact on several site condition attributes important to Squatter Pigeons, including decreasing species richness and cover of grasses, shrubs, and forbs, an increase in non-native plant cover and a decrease in quality and availability of food and foraging habitat.

Offset Calculator Input	Score	Comment
		The offset area contains a variety of WONS including Rubber Vine, Parthenium, Velvety tree pear and Lantana (within the offset Ecology Report in Appendix C), and which are subject to general biosecurity obligations. These species are highly invasive and coupled with habitat degradation by feral animals including Feral Pigs and Rabbits would exacerbate the spread and establishment of these invasive weeds. Associated impacts are likely to include increased erosion which can lead to further habitat disturbance. Further, increased erosion could lead to altered hydrological regimes and drainage, particularly in the alluvial soils, which is known to impact on nesting and foraging habitat. In addition, Queensland legislation allows for land managers to manage vegetation including establishing new infrastructure, fences, roads, tracks, fire management lines, firebreaks and thinning. When combined with cattle grazing, weed invasion and disturbance by feral animals, these actions would degrade woodland habitats, causing a further reduction in habitat quality associated with the ground layer and as such, Squatter Pigeon breeding, nesting, foraging and bathing habitat. Taking into consideration the above threatening processes, the predicted effects of these processes, current management practices and obligations on all landowners under Queensland biosecurity legislation to appropriately control invasive weeds and pest animals, no decrease in habitat quality is anticipated for the offset site without the offset being in place.
Future quality of the offset area with offset management	6	The quality of Squatter Pigeon habitat will be improved and maintained through the establishment of the proposed offset area. Future quality of the offset represents the ecological gain that can be achieved over 20 years of active land management practices to improve the ecological condition of habitat for the species. Detailed management actions are outlined in Section 6.0 of this OMP and are specifically targeted towards providing enhanced habitat values and include: • A pest management control program to reduce and the number pest animals, including Feral Pigs, Feral Horses and Rabbits that are currently degrading the offset area and promoting weed infestations and reducing native grasses, and Foxes, Feral Cats and Wild Dogs which are known predators of the MNES; • Strategic cattle grazing management to improve the condition of ground cover habitat, reduced weed infestations and excessive ground cover; • Weed management to reduce the infestation of weeds that currently out-compete native ground cover species, particularly the significant stands of Lantana within RE 11.3.4; and • Fire management to maintain a suitable ground cover biomass. Implementation of this OMP is expected to conservatively increase habitat quality over the 20 year period from 4/10 to 6/10.

Table 14 Generic habitat quality offsets calculator metrics (Confidence, Risk and time until benefit)

Confidence, Risk and Timeline	Score	Comments
Confidence in the offset achieving the predicted quality score	90 %	Implementing the actions outlined in this OMP will provide a high degree of confidence that a conservative increase in future habitat quality of two (2) from the current condition can be achieved. Annual reporting will be undertaken for compliance with the management actions outlined in the OMP. This will allow for timely identification of any corrective actions required. Biodiversity monitoring will also be conducted as part of the OMP (refer to Sections 7.2 and 1.1) to measure the progress of the offset area and ensure the offset area achieves its required offset obligations. It should be noted that an increase in future habitat quality of two (2) is conservative and is based on assessing the current habitat quality scores and those scores that could realistically be achieved through implementation of the management actions. An assessment has been undertaken and considered the current habitat score, the proposed management actions and the resulting changes to the habitat quality scoring. The proposed management actions are predicted to increase tree species recruitment, native plant species richness for trees and shrubs, decrease non-native plant cover, increase quality and availability of food and foraging habitat, increase the quality and availability of shelter and decrease threats to the species.
Risk of loss without the offset	0 %	Without the offset there is considered to be a zero (0) % risk that the vegetation communities will be lost (i.e. cleared) particularly with restrictions implemented by the Queensland Government on vegetation clearing for agricultural purposes. Although there are a number of threatening processes occurring within the offset area, these processes are likely to result in a loss of habitat quality rather than a loss of habitat *per se.* Based on these factors, zero (0) % is considered a reasonable estimate of the risk of loss without the offset.
Risk of loss with the offset	0 %	Risk of loss with offset is estimated to be zero (0) %. The offset area is proposed to be protected through a Voluntary Declaration which will prevent clearing. By definition, the risk of loss under a protection mechanism must be less than or equal to the risk of loss in the absence of such a mechanism. Therefore, a risk of loss with protection is also zero (0) %. The offset area will be declared as an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999* (VM Act).
Confidence in the risk of loss predictions	100 %	The legally binding Voluntary Declaration will be registered on the land title and will be binding on all current and future landowners to ensure that the habitat is protected in perpetuity. The legally binding mechanism precludes development unless the Queensland Government authorises an activity. However, for the activity to be authorised, offsets must be provided for the original offset obligation as well as any additional offsets that are required by the new activity. This process is very costly both economically and in time and provides a strong deterrent for development within a protected offset area.

Confidence, Risk and Timeline	Score	Comments
Time over which the risk of loss is averted	20 years	The offset area will be protected by a legally binding mechanism which will remain in effect in perpetuity as required by the applicable State and Commonwealth legislative requirements. Therefore, the time over which loss is averted is considered to be the maximum allowable time of 20 years as per the EPBC Offset Assessment Guide calculator.
Time until ecological benefit	20 years	It is estimated that to achieve an improved habitat quality score of two (2) units for all three MNES could take up to 20 years but improvements could occur in as little as 10 years. An improvement of two (2) units is achievable via increasing habitat quality. The improvement of habitat quality will be achieved by implementing a range of management actions (refer to Section 6.0) aimed at managing the current threatening processes that are constraining habitat improvement. Such actions will involve managing fire, grazing, weed and pest management and are aimed at increasing recruitment and establishment of large canopy trees which will increase foraging and shelter habitat as well as decreasing potential threats from feral animals and weeds. These management actions will result in an improvement in the habitat quality score within the 20 year timeframe.

4.4 Property Details

Landowner and relevant property details for the IPE offset area can be provided on request.

4.5 Registered Interests

There are currently no registered interests, no mining interests (exploration or production) and no petroleum interests (exploration or production) over the offset area.

4.6 Offset Area Protection Mechanism

The offset will be secured by a Voluntary Declaration under section 19E and 19F of the VM Act as an area of high nature conservation value. It is Stanmore's intention that the Voluntary Declaration will be declared over the proposed 290 ha offset area for Koala, Greater Glider and Squatter Pigeon within 3 years of commencement of clearing of habitat suitable for these species on the project site. The Voluntary Declaration will be registered on the property's title and will be binding on current and future landholders. Once the declaration has been registered on the property title, the offset area will be mapped as a Category A area on the Property Map of Assessable Vegetation (PMAV) which is shown as red and described as an "Area subject to compliance notices, offsets and voluntary declarations". Category A areas have a similar level of protection as endangered REs.

A Voluntary Declaration under the VM Act is an authorised legally binding mechanism and is considered an appropriate mechanism to legally secure MNES values and protect the area from vegetation clearing. The Voluntary Declaration will remain in place in perpetuity and may only be removed if the chief executive of the Queensland Department of Natural Resources and Mines considers it is necessary.

However, Queensland's Guide to Voluntary Declarations under the VM Act states that under Section 19L of the VM Act, a declaration cannot end (i.e. be removed from the property title) until the management outcomes of the management plan have been achieved. Hence, the legally binding mechanism, and by extension implementation of this OMP, will remain in effect for the period of the EPBC Act approval. The EPBC Act Environmental Offset Policy

states the offset must be provided for duration of the impact, which is in this instance indefinitely.

4.7 Environmental Offsets Framework

An overview of how the proposed offset area outlined in Section 4.3 meets the requirements of the EPBC Act Environmental Offsets Policy is outlined in Table 15.

The offset area meets the requirements of the Environmental Offsets Policy (EOP). Consideration was also given to property plans and any potential conflicting future use of the property to minimise the potential for conflicting land use pressures within and around the IPE offset area.

Table 15 EPBC Act environmental offsets policy requirements

Policy Requirements	Project Offsets
Deliver an overall conservation outcome that improves or maintains the viability of the MNES in question	The proposed offset area within Mt Spencer Station fully acquits the offset requirements for the approved impacts to the Koala, Greater Glider and Squatter Pigeon. The proposed offset area currently poses a number of threatening process that limit the habitat value of the area, in particular the low tree species recruitment levels, low abundance of large trees, degraded ground cover and presence of pest animals and weeds. The proposed offset area will be managed to improve habitat condition and the viability of all three MNES in accordance with EPBC Act offset obligations and the management action outlined in this OMP. The offset area will be managed and monitored for 20 years following approval of this OMP to ensure the future habitat condition improves to the predicted future habitat quality scores outlined in Table 10. Locating the offset on Lot 4 of Mt Spencer will also allow this Lot to receive greater management focus by the landowner relative to other sections of the wider Mt Spencer property. This in turn will allow the habitat quality for all three species to improve.
Be primarily built around direct offsets but may also include other compensatory measures	Mt Spencer Station is able to fully acquit the offset requirements for Koala, Greater Glider and Squatter Pigeon. Therefore, no other compensatory requirements are necessary.
Be in proportion to the level of statutory protection that applies to the MNES	The threat status of the Koala, Greater Glider and Squatter Pigeon is taken into account by the EPBC Offset Assessment Guide calculator in determining the area of the offset to be provided and was taken into account during the approval of the Project's impact.
Be of a size and scale proportionate to the residual impacts on the protected matter	The size of the proposed offset area has been calculated in accordance with the EPBC Act Environmental Offsets Policy and the EPBC Offset Assessment Guide calculator. Inputs and justifications are based on the results of the detailed field assessments that were undertaken within the impact and offset areas with the corresponding habitat quality calculated in accordance with the DES Guide and the methods outlined in Section 4.1.
Account for and manage the risks of the offset not succeeding	The suitability of the offset area has been calculated in accordance with EPBC Act Environmental Offsets Policy and the EPBC Offset Assessment Guide calculator which takes into consideration a number of metrics including confidence in the

Policy Requirements	Project Offsets
	offset succeeding. The inputs and justifications are shown in Table 11, Table 12, Table 13 and Table 14. Risks associated with the offset have been assessed (refer to Table 25) and appropriate mitigation and management measures are provided in Table 25. Further, locating the offsets within Mt Spencer Station provides a further level of certainty of success as the property is multi-generational and is also used as a rehabilitation site for returning injured wildlife, including Koalas to the wild. Hence, the management actions required to enhance habitat values and protect fauna species are well known.
Be additional to what is already required	The proposed IPE offset area is zoned rural under the Nebo Shire Planning Scheme 2008 and is located within the Isaac Regional Council Local Government Area. These areas have been historically used for cattle grazing with improvements including water storages, fencing and dirt roads. The landowner is currently obliged to appropriately manage pest animals and invasive weed species to protect environmental values (amongst other values) under state government general biosecurity obligations. However, the proposed pest animal and weed management activities are additional to those required under the *Biosecurity Act 2014* (Qld). See Section 6.7 and 6.8 for further detail.
Be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offset area has been identified and its suitability assessed using standard practices approved by both Commonwealth and State Governments and were undertaken by suitably qualified ecologists using an evidence-based and scientifically robust approach. Stanmore commits to legally securing the offset area within three years of the impact area clearing being undertaken as per the EPBC approval conditions. This OMP outlines a transparent and scientifically robust ongoing monitoring program (refer to Section 7.0) that can be readily audited to assess its effectiveness of assessing the success of the offset area in achieving the required offset obligations. Further, this OMP supports an efficient, effective, timely, transparent, scientifically robust and reasonable approach to providing offsets.
Have transparent governance arrangements including management actions, monitoring and auditing	This OMP outlines a clear governance framework and delivery pathway to legally secure the offset area and a transparent and scientifically robust monitoring and reporting program. The OMP also provides an auditing framework that allows for continual improvement to ensure the offset area achieves the required offset obligations.

4.8 Additional Management and Protection

Establishing the offset on the proposed area would add additional protection for biodiversity values from clearing and provide additional biosecurity management. However, remnant vegetation is still subject to limited clearing for essential management as well as removal/thinning of undergrowth vegetation and removal of fallen woody debris. Further, the VM Act does not require landholders to maintain the existing condition of regulated vegetation or fauna habitat areas. Establishing the offset would therefore provide additional protection and management for both remnant and the non-remnant vegetation.

Queensland's *Biosecurity Act 2014* imposes a 'general biosecurity obligation' on all people to manage biosecurity risks that area under their control and that they know about or could

reasonably be expected to know about. In general terms, this means that for livestock owners, the owner is expected to stay informed about pests and diseases that could affect or be carried by the animals, as well as weeds and pest animals that could be present on their property. Landowners are also expected to manage them appropriately. For landowners, there is an expectation that they will stay informed about the weeds and pest animals (such as feral dogs, cats, pigs etc.) that could be on their property. There is also an expectation that appropriate management will be undertaken.

The obligations outlined in this OMP are additional to these general *Biosecurity Act 2014* obligations. For example, ongoing feral animal control will be undertaken to minimise the numbers of all feral animals with the end goal being eradication, where possible. This is above and beyond the requirements of the *Biosecurity Act* as is the reduction of weed species to less than 10% weed cover within the offset area over the life of the OMP.

5.0 Management Objectives

The environmental outcomes sought by this OMP are to improve the condition and ecological values of the vegetation communities for the Koala, Greater Glider and Squatter Pigeon within the offset area. These environmental outcomes will be realised by achieving the completion criteria for each matter defined in Table 17.

Implementation of this OMP will also effectively manage risks to the Koala, Greater Glider and Squatter Pigeon and implement adaptive management actions to continually refine, revise and update the management actions as additional data on the success of the offset area is collected.

As outlined in Table 18, the specific management objectives of this OMP are to:

- Strategically graze cattle to reduce and manage understorey fuel loads and native and non-native flora densities;
- Reduce the risk of unplanned fire causing adverse impacts to MNES through strategic fire management;
- Minimise habitat degradation caused by Feral Pigs (*Sus scrofa*) and Rabbits (*Oryctolagus cuniculus*), Feral Horses *(Equus caballus*) to reduce impacts on habitat variables for MNES including tree species recruitment and understorey vegetation composition;
- Restrict unauthorised access and prevent alternative land-use;
- Control invasive weed species to reduce impacts on MNES from an overdominance of non-native floristic abundance in the understorey; and
- Minimise predation risk to MNES by Feral Cats (*Felis catus*), Wild Dogs (*Canis domesticus*) and Foxes (*Vulpes vulpes*).

These management objectives and the corresponding management actions outlined in Section 6.0 and Table 18 are specific to the 290 ha offset area and based on the MNES requiring offsetting, with consideration of identified threats and recovery actions specific to each species as outlined in the Commonwealth listing and conservation advice, recovery plans and other relevant documents (Table 16).

Table 16 Relevant conservation advice, recovery plans and threat abatement plans

MNES	Relevant conservation advice and plans	Main threats and recommended actions	Measures proposed in this OMP
Koala	• Approved Conservation Advice for *Phascolarctos cinereus*, Koala (combined populations in Queensland, New South Wales and the Australian Capital Territory), (SEWPaC, 2012); • Threat abatement plan for predation by feral cats (Commonwealth of Australia, 2015); and • Threat abatement plan for predation by the European red fox (DEWHA 2008a).	• Habitat fragmentation, vehicle strike and predation. • Feral Cat control strategies. • European Fox control strategies.	• Avoidance of habitat clearing by using existing tracks and fence lines. • Vehicle access and movement restrictions. • Restricted offset area access and educational awareness of MNES. • Feral animal control strategies.

MNES	Relevant conservation advice and plans	Main threats and recommended actions	Measures proposed in this OMP
Greater Glider	• Conservation Advice for *Petauroides volans*, Greater Glider (TSSC, 2016).	• Habitat loss, fires and predation from owls.	• Avoidance of habitat clearing by using existing tracks and fence lines. • Fire management regimes. • Installation of artificial hollows to provide shelter habitat.
Squatter Pigeon (Southern)	• Approved Conservation Advice for *Geophaps scripta scripta* (Squatter Pigeon (southern)) (TSSC, 2015); • Threat abatement plan for predation by feral cats (Commonwealth of Australia, 2015); • Threat abatement plan for competition and land degradation by rabbits (Commonwealth of Australia, 2016); and • Threat abatement plan for predation by the European red fox (DEWHA 2008a).	• Habitat clearing. • Livestock and feral herbivore grazing. • Predation by Feral Cats and European Foxes. • Feral Cat control strategies. • European Fox control strategies	• Avoidance of habitat clearing by using existing tracks and fence lines. • Strategic grazing practices. • Grazing exclusion periods. • Feral animal control strategies. • Installation of one artificial watering point.

5.1 Completion Criteria and Interim Performance Targets

The EPBC Act EOP states that an offset area must deliver an overall conservation outcome that improves or maintains the viability of the MNES as if the action had not occurred. In accordance with the EOP the final habitat quality score (offset completion criteria) at the offset site must be equal to or greater than the habitat quality score of the impact area.

Completion criteria and interim performance targets associated with habitat for each MNES are summarised in Table 17 and have been developed as a measure to assess and ensure that the final habitat quality scores as outlined for each of the offset matters in Section 4.3.2, are achieved. Interim performance targets are also included in Table 17. The intent of these targets is to assess, revise and if required, amend the OMP to allow the completion criteria to be achieved within the proposed 20-year time frame. The interim performance targets will help to assist the management and improvement of the offset area, enabling evaluation of the effectiveness of progress towards completion criteria.

The completion criteria and corresponding increase in habitat quality scores will be reached by the implementation of the management actions outlined in Table 18 and ongoing monitoring of the effectiveness of those actions. Annual reports will provide transparency regarding the implementation of the management measures and where relevant, identify any non-compliance with the OMP and *force majeure* events that impact the offset area. Failing to meet the interim performance targets will prompt adaptive management and the landowner will apply various mitigation measures to ensure the completion criteria will be met. The need for additional mitigation measures will be addressed during the annual compliance reporting of the OMP.

The interim performance targets and completion criteria in the form of habitat quality scores for each of the MNES are outlined in Table 17 and have been developed as a measure to assess and ensure that the final habitat quality scores (competition criteria) as outlined for each of the offset matters in Section 4.3.2, are achieved. The completion criteria and corresponding increase in habitat quality scores will be reached by implementing the management actions outlined in Table 18 and monitoring of those actions (refer to Section 7.0).

The intent of the interim performance targets is to assess, revise and if required, amend the OMP such that the completion criteria can be attained within the proposed 20 year time frame. Corrective actions that must be undertaken if interim performance targets are not met are outlined in Table 18.

Table 17 Completion Criteria and Interim Values

Assessment Unit	Starting Habitat Quality Score	Interim Performance Targets			Final Habitat Quality (Year 20) – Completion Criteria
		Year 5	Year 10	Year 15	
Koala					
AU1 - RE 11.12.1	4	4-4.5	4.5-5	5-5.5	5.5-6
AU2 - RE 11.3.4	4	4-4.5	4.5-5	5-5.5	5.5-6
AU3 - RE 11.3.4 non-remnant	4	4-4.5	4.5-5	5-5.5	5.5-6
Weighted total	4	4-4.5	4.5-5	5-5.5	5.5-6
Greater Glider					
AU1 - RE 11.12.1	4	4-4.5	4.5-5	5-5.5	5.5-6
AU2 - RE 11.3.4	4	4-4.5	4.5-5	5-5.5	5.5-6
AU3 - RE 11.3.4 non-remnant	4	4-4.5	4.5-5	5-5.5	5.5-6
Weighted total	4	4-4.5	4.5-5	5-5.5	5.5-6
Squatter Pigeon					
AU1 - RE 11.12.1	4	4-4.5	4.5-5	5-5.5	5.5-6
AU2 - RE 11.3.4	4	4-4.5	4.5-5	5-5.5	5.5-6
AU3 - RE 11.3.4 non-remnant	4	4-4.5	4.5-5	5-5.5	5.5-6
Weighted total	4	4-4.5	4.5-5	5-5.5	5.5-6
*Note that interim and complete scores will be calculated using methodology consistent with the initial surveys see section 4.1					

The completion criteria and final habitat scores for each MNES will be calculated using the scoring method described in Section 4.1. The specific attributes of site condition, site context and species stocking rate that are expected to change over the life of the approval and lead to the final habitat score/competition criteria may change from those outlined below. However, the calculation method will remain unchanged and the final habitat quality/completion criteria scores remain as outlined in Table 17.

It is anticipated that with the management measures described in section 6.0, habitat quality improvements will be made be as follows:

- Remnant RE 11.3.4 and 11.12.1 will improve in habitat quality score of two (2) points from predicted increase in habitat quality scores by
    - Increasing recruitment of Woody perennials in the ecologically dominant layer (EDL) by reducing competition from non-native shrub species, cattle grazing management to reduce the effects of cattle grazing such as trampling

and over-grazing and controlled burning to abate the effects of hot fires. Fire regime should be in accordance with the fire management guidelines for these RE type that are designed to maintain and enhance biodiversity.

- Increasing native perennial richness of shrubs and forbs.
- Increasing shrub cover and recruitment.
- Increasing native grass species richness
- Organic litter cover and course woody debris increase is expected with the growth of above ground biomass of tree species over time and the application of the appropriate fire regime.
- The number of large trees are expected to increase through natural growth of canopy and subcanopy trees by excluding any selective harvesting of both Eucalypt and non-Eucalypts trees and implementing controlled burns.
- Increasing large trees and controlling the potential for hot fires, coarse woody debris is expected to increase.
- Exotic cover (weeds) is expected to be reduced within the first 5 years by mechanical removal, spraying and an appropriate fire regime. The control of exotic species should be applied throughout the life (20 years) of the offset to maintain weed cover at <10%.
- Providing habitat enhancement (e.g. watering points, nest boxes) that will encourage the three species to inhabit the offsets area.

- Non-remnant RE 11.3.4[6] will improve in habitat quality score of two (2) point from predicted increase in BioCondition scores by:
  - Minimising the removal of Eucalypt and non-Eucalypt regrowth and mature paddock trees.
  - Increasing native perennial richness of shrubs and forbs.
  - Increasing shrub cover and recruitment.
  - Increasing native grass species richness.
  - Exotic cover of shrub layer species is expected to reduce within the first 5 years by mechanical removal, spraying and an appropriate fire regime.

In addition to the above habitat attributes, threats to the MNES can be reduced by:

- Koala: Threats to koalas can be reduced by feral animal control of predatory species including Feral Dogs, and a reduction of hot fires by reducing fuel loads, especially exotic shrub layer species including Lantana. This would reduce the ability of fire to ladder into the canopies of the tree layers that are utilised as food and refuge trees.
- Greater Glider: Threats to Greater Gliders can be reduced by feral animal control of predatory species including Feral Cats and reducing hot and intense fires by reducing fuel loads, especially exotic shrub layer species including Lantana. This would reduce the ability of fire to ladder into the canopies of the tree layers that are utilised as food and denning trees and reduce direct destruction of suitable tree hollows and tree hollows that may provide suitable habitat over time. Installation of species-specific artificial nest boxes that are targeted specifically to the Greater Glider will be installed

[6] This non-remnant vegetation community includes species consistent with RE 11.3.4.

at a density of at least one (1) box per 10 ha or approximately 29 boxes within the 290 ha offset area and primarily within RE 11.3.4 and the surrounding habitat of RE 11.12.1. Further, careful consideration will be given to the location, spatial configuration of the installed boxes. The boxes will be maintained for the duration of the offset. It is expected that with these measures, Greater Gliders will occupy the IPEE offset area.

- Squatter Pigeon: Threats to Squatter Pigeons can be reduced by feral animal control of predatory species including Feral Cats, Feral Dogs and Feral Pigs and increase shrub and canopy cover to provide cover/shelter from predatory birds.

Overall, the increases in habitat quality scores will increase the quality of Koala, Greater Glider and Squatter Pigeon habitat by improving the quality of the grassy areas and woodlands, encouraging tree recruitment and decreasing the weed cover.

6.0 Management Actions

This OMP is based on the principles of adaptive management, and management objectives and actions that have been developed based on field surveys. The ongoing suitability of the management actions will be informed by the results of the monitoring activities outlined in Section 7.0. This OMP will be adapted and updated annually, if required as determined by any corrective actions as outlined in Table 18.

This section of the OMP outlines the management actions that will be implemented within the offset area to abate the identified threats to the Koala, Greater Glider and Squatter Pigeon and to protect and enhance the habitat values of the offset area. The management actions focus on the key threatening processes for these species as outlined in Section 6.0 and described in the DAWE SPRAT species profiles and relevant EPBC Act statutory documents for the species. Additional threats that are known to degrade habitat have also been taken into consideration.

Detailed management actions for the offsets area are outlined in Table 18 and discussed further in the following sections along with general management actions applicable to the offset area. The majority of the ongoing and routine management actions are expected to be undertaken by the registered landowner (e.g. grazing management, fire management, feral animal and weed management) under agreement with Stanmore. However, ongoing ecological monitoring will be undertaken by suitably qualified ecologists also under agreement with Stanmore. Artificial nest boxes will be designed and installed and maintained in consultation with expert advice including that of Associate Professor Ross Goldingay at Southern Cross University.

Should the results of ongoing monitoring identify that the relevant management action(s) have been unsuccessful, corrective action(s) will be undertaken and the management actions reviewed and updated accordingly as shown in Table 18.

Table 18 Management actions, triggers for further action and corrective actions

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
Habitat or vegetation loss through unplanned land clearing	• No unapproved and/or intentional clearing of vegetation within the offset area, except for clearing that under Queensland's VM Act (e.g. for fencing, access, firebreaks or public safety). • Signs and fences will be erected within three months of the offset being legally secured. They will be erected at all entrances and potential access points to the site identifying the area as an environmental offset and stating that access to the site is forbidden. • Fences will be maintained to prevent unauthorised access, to minimise incursions by feral herbivores and to control stock presence • Ecological thinning may be carried out, but only in accordance with the advice of a suitably qualified expert, only as allowed under Queensland's VM Act and only after notifying DAWE	• Any activities that are in contravention of the Voluntary Declaration. • Detection of damaged fences associated with vehicle access roads/tracks • Detection of prohibited forestry operations, native timber harvesting or clearing outside of established access tracks, fire control lines and fence lines (existing infrastructure).	• Monitoring and inspections will monitor and document if there is evidence of recent forestry or timber harvesting activities or illegal clearing. • Monitoring will also document vegetation clearing that has occurred for fire break, access road or fence line maintenance. • Refer to Section 7.0 for detail on required monitoring. • The annual compliance report will document any illegal/ unauthorised land clearing.	• Notify the Department within 10 business days of clearing • Upon being notified or becoming aware of prohibited forestry operations, native timber harvesting or clearing outside of existing infrastructure, the landholder is to assess how unauthorised persons accessed the site • Review existing access restrictions and inspect signage and offset area fencing within one fortnight of detection of the clearing. • Corrective actions will be implemented immediately (e.g. the regeneration of those areas will be undertaken, and these areas added to the ongoing monitoring sites) and if appropriate the OMP will be revised and updated if required. • Any changes to the OMP will be reported to the Minister for approval prior to changes in management.
Control invasive weed species to reduce impacts on MNES from an overdominance of	• Access to the offset site will be restricted to authorised persons only.	• An increase in the average percent (%) cover score of weed species from baseline	• Monitoring of weeds and non-native plants will be undertaken during the habitat quality assessment surveys	• Any increase in the relative abundance of invasive or other weed populations from those recorded during the baseline

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
non-native floristic abundance in the understorey.	• Weed management and weed hygiene restrictions will be implemented across the offset site to reduce the extent of existing weeds and to control the potential introduction of other exotic weed species. • Weed hygiene and management will be undertaken in consultation with the landowner. • Chemical and/or mechanical control of declared weed species will be undertaken in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets or other sources of information. • Refer to section 6.8 for further details on weed management.	and/or previous monitoring events. • Outbreak of infestations of weed species not previously recorded in the offset area during baseline and/or previous monitoring events. • An increase in the presence of weeds (relative abundance and/or area of occurrence) as determined from photo monitoring results. • An interim performance target is not attained, or a completion criterion is not attained and/or maintained.	using the same methodology used to the baseline habitat quality as outlined in the DES Guide to Determining Terrestrial Habitat Quality, as well as incidental observations as part of routine management. • The annual compliance report will document the presence of weeds, weed control measures and extent of weed cover during the reporting period, and the relevant responsive actions.	survey, or subsequent monitoring events will trigger the following corrective actions that must be undertaken: ○ Review adherence to current weed hygiene procedures to ensure compliance and to update restrictions. ○ Review timing and frequency of weed management measures, and implement alternative weed management timeframes. ○ Investigate alternative weed management control actions (e.g. spot spraying and/or injection of herbicides) and implement. ○ Undertake additional weed management measures until weed populations are reduced. • Suitably qualified ecologist to review the OMP within one month and update if required.
Strategic cattle grazing to reduce and manage understorey fuel loads and native and non-native flora densities.	• Stock management will be undertaken in consultation with the landowner and as required to achieve the performance objectives and completion criteria. • If and where new fencing is required to demarcate the offset area, ensure fencing is	• Livestock located in the offset areas outside of strategic grazing events. • Livestock located in the offset areas during breeding season (May to and including July).	• Regular inspections of the offset area will be undertaken during normal land management and farming practices to examine fence lines when stock are grazing in the offset area and/or adjacent to the offset area.	• Amend livestock management practices including amendment of stocking rates, and/or timing, and/or duration and/or frequency of strategic grazing events until native grass cover is >30% <55%.

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
	permanent and prohibit unintended grazing by cattle. • Squatter Pigeon breeding period can vary depending on localised site conditions but generally peaks in the early to mid-dry season (May-July). Grazing will be excluded during the peak Squatter Pigeon breeding and egg laying periods in the early to mid-dry season.	• Damaged fencing is observed • Habitat Quality assessments indicate native grass groundcover is <30% or >55%. • If ecological surveys indicate an extended or varied peak breeding period outside the early to mid-dry season.	• Records will be kept of when and how many cattle graze in offset areas. • Regular inspections will be undertaken to assess signs of overgrazing and pugging. • Habitat quality assessments will be undertaken in accordance with this OMP and will include assessment of percentage cover of native perennial grasses.	• Repair fencing if damaged within one week of detection. • Removing stock when excessive pugging or overgrazing is observed such that native grass cover is <30%. • Remove stock from Squatter Pigeon breeding habitat where found to be grazing in Squatter Pigeon breeding season. • Construct additional fencing if required. • Should monitoring activities identify triggers for further action, the OMP will be reviewed by a suitably qualified ecologist within one month and updated if required. • Any corrective action identified will be implemented within 1 month of the OMP being updated.
Minimise habitat degradation caused by feral animals including Feral Pigs and Feral Horses.	• Pest animal management will be undertaken in consultation with the landowner and in accordance with general pest management processes. Refer to Section 6.7 for details. • Pest management will include a range of best management practice	• Any increase in sightings/signs (tracks) and/or the relative abundance of pest animals above baseline levels and/or previous monitoring event. • Observation of, or signs of, a feral animal not identified as occurring within the Project area during the baseline surveys.	• Feral animal presence will be monitored as a minimum through visual signs recorded during monitoring and direct observations. Remote camera monitoring will also be used to assess the presence of feral animals. • Feral animal monitoring results, and associated actions, will be included in	• Review adherence to pest animal management actions. • Investigate potential sources or reasons for an increase in pest animal numbers and rectify. • Increase the frequency or revise the type of invasive pest animal control efforts in accordance with DAF guidelines, and in

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
	actions including shooting, trapping, fencing and baiting, and will be undertaken in accordance with Queensland's Department of Agriculture and Fisheries (DAF) guidelines[7] and the requirements of the *Biosecurity Act 2014.* • If an increase in feral pest species is noted above trigger levels, additional pest management/control measures will be instigated until the increased activity has ceased.	• Habitat quality scores for interim performance targets are not by: o Year 5 o Year 10 o Year 15 o Year 20	annual reporting to the Department. • Monitoring of habitat quality scores will be undertaken. The results of monitoring events will be compared against baseline habitat quality scores, interim performance targets and completion criteria to determine the progress of the offset area and recorded as part of reporting.	conjunction with neighbouring landowners. • Suitably qualified ecologist to review the OMP within one month and update if required.
Reduce the risk of unplanned fire causing adverse impacts to MNES by strategic fire management[8].	• Controlled burns will be undertaken in consultation with the landowner and in accordance with the recommended fire management guidelines for Regional Ecosystems and will involve a range of burn strategies including patchwork burns. • Fire is to be excluded from the offset area except for planned and strategic burns	• Unplanned fire within the offset area. • Planned fires become out of control or the required burning regime is not achieved. • Habitat Quality assessments indicate native grass groundcover is <30% or >55%.	• Fire breaks are to be inspected annually in September • Visual inspection of signs of fire during routine land management and during the habitat quality assessments. • Fuel loads will be monitored through monitoring of ground cover and to inform fire management strategies.	• Occurrences of fire are to be recorded during the visual inspections undertaken during routine land management. • If an uncontrolled bushfire has impacted the offset area (including if controlled burning becomes out of control), review the grazing management and fire management strategies and adherence to these strategies and exclude cattle for at least three-six months (depending on

[7] https://www.daf.qld.gov.au/business-priorities/plants/weeds-pest-animals-ants
[8] https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/fire-management

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
	as required to reduce understorey fuel loads having a detrimental impact on canopy tree recruitment and establishment and to maintain existing fire breaks. • Create firebreaks around the offset area boundary to minimise unplanned fire from adjacent lands. • Firebreaks are to be co-located, where possible, with roads, fence lines and vehicle access tracks. No areas of MNES will be cleared unless necessary for safety management and without consideration to the impacts and Department requirements, i.e. habitat areas are not reduced.			conditions for re-growth). All fire breaks will be inspected, maintained, and repaired if required. • To ensure compliance with performance criteria, undertake remedial action including: o Alteration to stocking rates, and/or duration and frequency of strategic grazing events; and/or o Amendments to fire management practices as required including fire safety and containment management. • Suitably qualified ecologist to review the OMP within one month and update if required.
Habitat degradation and direct impact to MNES due to unauthorised access to offset site.	• All signs and fences will be erected within three months of the offset being legally secured. • Signs will be erected at all entrances and potential access points to the site stating that access to the site is forbidden. • Fences will be maintained to prevent unauthorised access, to minimise incursions by feral	• Evidence of unauthorised or unplanned access by persons, vehicles, and/or stock is detected during exclusion periods. • Evidence of stock is detected at any point during exclusion times. • Damage is detected to any fence or sign.	• Monitoring of fence lines will be undertaken by the Landholder or suitable qualified person appointed by the approval holder within 3 months of the offset area being legally secured and during quarterly inspections. • Inspections will monitor and document damage or loss of signs and evidence of unauthorised access to the offset area.	• Upon being notified or becoming aware of prohibited access to the offset area, the approval holder is to reassess access protocols for any lessees etc., signage and general access within one fortnight. • Damage to signage and fences will be repaired within one month of noting the damage. • If there are areas that have been negatively impacted by unauthorised access, the

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
	herbivores and to control stock presence.			regeneration of those areas will be undertaken, and these areas added to the ongoing monitoring sites. • Signage will be repaired and maintained as required by the Landholder or suitable qualified person appointed by the approval holder.
Offset fails to achieve the interim performance targets and completion criteria within the anticipated 5, 10, 15 and/or 20-year time intervals.	• All management actions outlined in this OMP will be implemented to ensure that the interim performance targets and competition criteria are achieved. • The Voluntary Declaration under the VM Act will ensure that the landholder remains obliged to undertake active management of the offset until all completion criteria are achieved. • Monitoring will continue for the life of the approval to ensure that completion criteria have been met and maintained.	• Interim performance targets are not achieved by year 5, 10 or 15. • Completion criteria are not achieved by year 20.	• Habitat quality score assessments will be undertaken for each 5-year period, as a minimum. • Monitoring of the offset area will be undertaken in accordance with the methods outlined in this OMP. • Monitoring results will be compared against the interim performance targets and completion criteria to assess progress of offset area in achieving the requirements of this OMP.	• Within one month of detection of the trigger, complete an investigation into the reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. This investigation must re-evaluate the suitability of the relevant management actions and identify appropriate corrective actions. • As soon as practicable, and within six months of detection of the trigger, implement revised corrective actions. These may include (but not limited to): o Increasing the frequency and intensity of pest animal and weed control measures or revising the type of measures to be implemented. o Modify fire management measures, to better support

Habitat management objectives	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions
				enhancement of offset values. ○ If the investigation outlined above requires changes to the management actions, then as soon as possible, and within six months of detection of the trigger, implement a revised OMP, as approved by the Minister, incorporating those recommended changes. ○ Additional offsets will need to be sought by the approval holder, and approved by the Minister, should the above corrective actions not be successful.

6.1 Supplemental Habitat Features

Supplemental habitat features such as the installation of artificial watering points for Squatter Pigeons and artificial hollows (nest boxes) for the Greater Glider will be added throughout the offset area to maximise the potential for these species to occur in the offset area and their populations to increase.

For supplemental watering points, an additional one (1) will be installed in areas where existing permanent water sources are not available. The final number, method and location of these watering points will be determined by suitably qualified ecologists and the landholder during the year 1 comprehensive survey. In practice, the watering points could be installation of new water bores, new water holding tanks supplied by overland pipes from existing bores or the installation of new dams to collect overland flow (noting that there must be no loss of MNES habitat).

For nest boxes, the potential for Greater Glider to occupy boxes will depend heavily on the size of the entrance and dimensions of the boxes as well as the location and spatial configuration in the landscape. The design and location of nest boxes is yet to be determined but will be done in consultation with experts in the field of nest box design for arboreal mammals. At a minimum, at least one (1) nest box per 10 ha will be installed within the 290 ha offset area (e.g. 29 boxes) and installation will be centred around the riparian zone of RE 11.3.4 but also within the adjacent RE 11.12.1. Ongoing and detailed monitoring of the installed nest boxes will be undertaken to confirm utilisation and operability (refer to Section 7.0) and included in required monitoring reporting. Any nonoperational boxes (damaged) will either be repaired or replaced, and these actions will be included in required reporting.

6.2 Access and Fencing

Access to the offset area is restricted to authorised personnel only including the landowner and persons authorised by the landowner and Stanmore to undertake monitoring programs and maintenance. Existing and new fences, if required, will be used to restrict access into offset areas. Signs will be erected in prominent locations (i.e. at access points into the offset site) which recognise that the area is protected for conservation purposes and that access into these areas is restricted to authorised personnel only. Signs will be installed prior to commencement of the action. Environmental awareness training will be provided to all workers as part of site induction and will include specific topics on MNES, risks and protective measures, and identification of the MNES.

Existing access tracks will be used to enable management, monitoring and maintenance to be undertaken. In the event that existing access tracks become impassable (e.g. from erosion, flooding or vegetation regrowth), maintenance and remediation of the existing access tracks will be undertaken. Any new access tracks will be noted in revisions of this OMP and the offset area increased accordingly. Should new tracks be required, consultation will be undertaken with DAWE prior to construction to ensure appropriate approvals, if required, are obtained including Minister approval of any revised OMP.

6.3 Vehicles

Vehicle access will be restricted to vehicles (e.g. quad bikes) approved by the landowner/offset area manager and Stanmore. Vehicle movement will be limited to designated access tracks in the offset area and vehicles will travel to track conditions and as advised by the landowner/offset area manager in order to minimise the risk of injury to MNES, particularly Koalas and Squatter Pigeons, or habitat degradation by vehicles and/or recovery machinery should vehicles become bogged or accidents occur. Speed limits of 30 km/h will be enforced by the landowner on access tracks throughout the offset area and access to the offset area along the road licence easement will be restricted by the landowner.

Persons entering the offset area will be required to ensure all vehicles and equipment are certified weed free. Any authorised personnel (e.g. contractors) entering the offset area will be required to hold a current weed hygiene certificate and be approved to access the area by the landowner/offset area manager. Evidence is to be provided on request to the landowner that vehicles and any machinery are weed and seed free prior to entry to minimise potential weed spread. Records of people entering the offset area and evidence of certified weed free must be kept and provided to the Department upon request.

All vehicles entering the offset area will be required to stay on the formed tracks and be issued with weed inspection certificates and all staff or contractors entering offset areas are to be made aware of, and provided access to, this OMP.

6.4 Vegetation Clearing

Vegetation clearing is not permitted within the offset area. With the exception of clearing that is exempt under Queensland's VM Act and is required for:

- Maintenance of currently established access tracks and/or fire breaks;
- As directed by emergency management response personnel in the event of uncontrolled bushfire or other emergency procedures. Any native vegetation cleared from the offset area in this circumstance will be revegetated using the same species that were cleared. The OMP will be revised to include revegetation works and submitted to DAWE within 3 months of this clearing occurring.

6.5 Grazing Management

The offset area has historically been used for cattle grazing and there was evidence of grazing throughout the offset area. To optimise canopy tree recruitment and establishment and to achieve the interim performance targets and final completion criteria of ground layer species richness and cover, grazing will be strategically controlled to allow the ecological communities/species habitat to continue to improve, to minimise unplanned fires adversely impacting the offset area, and to minimise soil compaction and erosion.

Existing fences will be used to manage access to and demarcate the offset area, including management of strategic grazing activities. If and where additional fencing is required to be installed, it should preferably be constructed of 1.4 m high, 4-strand barbed-wire, with plain wire as the top strand and the bottom wire set 350 mm from the ground to allow native wildlife access, or an alternative and equally suitable fence design as determined by the landowner. Restricted access will also be established prior to commencement of the action to prevent unauthorised access.

Grazing will be permitted throughout the offset area under strict controls in order to reduce fuel loads, to control exotic flora and to increase native species richness of the ground layer. Following grazing, the offset area will be spelled in accordance with the current land management practices undertaken on Mt Spencer Station to allow for grasses to seed and to facilitate recovery of perennial grasses and the herbaceous layer while mitigating wildfire risk by restricting fuel loads. The suitability of conditions for undertaking a grazing event outside of the wet season will be directed by the landowner/offset area manager and based on sound environmental practices.

To minimise erosion and subsequent impacts on water quality that may in turn impact on Squatter Pigeon habitat and/or affect attainment of the interim performance targets and/or completion criteria, strategic grazing will be excluded where rainfall causes inundated or waterlogged soils. Grazing will also be restricted within the offset area during the peak breeding and egg laying season for the Squatter Pigeon which is the early to mid-dry season (i.e. May-July). The location and extent of grazing exclusion areas will be reviewed annually based on the results of management and monitoring events.

Strategic grazing will be determined by biomass monitoring described in Section 7.8.

6.6 Fire Management

Fuel loads in the offset area and in the surrounding paddocks will be controlled through a combination of strategic grazing, weed control measures and fuel reduction burns to minimise the risk and impacts of unplanned and hot and intense fires, and to improve habitat quality through controlling weeds and increased recruitment and establishment of native plants.

Regular maintenance (e.g. grading and vegetation spraying) of firebreaks, roads and tracks will be an integral part of fire management to mitigate the risks associated with unplanned fire. Ground cover monitoring will be undertaken annually as part of fire management activities to assess fuel loads, determine the risk of unplanned fires to the offset area and inform fire management strategies (Section 7.8).

Fire management will be consistent with the recommend fire management regime for REs within the offset area as recommended in the Fire Management Guidelines produced by the Queensland Herbarium (refer to Appendix F for the relevant fire management regime for each of the REs composing the mixed RE vegetation community of the offset area).

All of the REs within the offset area benefit from controlled burns of low intensity fires that occur in the early dry season where there is good soil moisture. Controlled burns will be low intensity with the aim of reducing fuel loads and promoting understorey growth. Moderate to high intensity fires will be avoided as they can degrade vegetation structure and destroy fauna habitats, particularly tree hollows and kill native fauna.

Good fire management within offset areas should be based on maintaining vegetation composition, structural diversity, animal habitats (in particular hollow-bearing trees and logs) and preventing extensive wildfires. The recommended control burn intervals vary depending on the RE and range from every 2-7 years for RE 11.3.4 to every 6-15 years for RE 11.12.1. Shorter intervals between burns for RE 11.12.1 of 5-10 years can be undertaken but should be greater than every three (3) years. To cover the requirements of the REs and MNES within the offset area, controlled burns will be undertaken every 5-10 years depending on fuel loads and groundcover and undertaken in general accordance with the Fire Management Guidelines. Burn intervals for conservation purposes will differ from that for grazing purposes with the latter generally being much shorter. For riparian vegetation such as RE 11.3.4, fires will be ignited from the upper ridges so that they burn downwards towards the lower slopes.

6.7 Pest Animal Management

Several pest animals have been recorded in the offset area and include Wild Dogs, Feral Pigs, Rabbits, Feral Cats, Feral Horses and Foxes. These pest animals pose threats to the MNES including predation (Wild Dogs, Feral Cats and Foxes) and habitat degradation (Feral Pigs, Feral Horses and Rabbits).

Additional assessments of pest animals will be undertaken as part of a comprehensive baseline habitat quality assessment that will be undertaken in year one (1) (refer to Sections 7.2 and 7.7). These assessments will form part of the ongoing monitoring program and will consist of surveys to assess the presence, and extent of, pest animals within the offset area and to also assess impacts to fauna habitat values and vegetation condition (refer to Section 7.0 for monitoring schedules). Results from these assessments will inform the most appropriate species-specific control measures and management activities. These results and any additional management actions will be included in an updated OMP and as part of the annual compliance report.

Pest animal controls will be undertaken in accordance with the *Biosecurity Act 2014*, DAF guidelines and in conjunction with neighbouring landowners and include the following control methods as approved by DAF:

- Wild Dogs (DAF, 2017): Shooting, trapping, baiting and fencing. Baiting and trapping will be undertaken at peak activity times including breeding (March/May) and rearing of young (September/November) and will target watering locations. Dingoes will not be shot or trapped. One or a combination of the control methods outlined below will be implemented to reduce the abundance of Wild Dogs accessing/utilising the offset area.
    - Shooting is an opportunistic method, mostly used for control of small populations or individual problem animals.
    - Trapping is predominantly used in areas with low populations and to control 'problem' Wild Dogs. Foot-hold traps will be used at times of the year corresponding with peak activity, with traps placed in high activity areas and poisoned with strychnine for humane reasons and to prevent escape. Lures such as scents can be used to attract dogs to the traps.
    - Baiting can be used in conjunction with other control tools. Poison baits using 1080 and strychnine and fresh meat baits are delivered by hand, from vehicles or aircraft.
- Feral Pigs (DAF, 2016a): Control of Feral Pigs will be by implementing a collaborative approach with surrounding landowners and will include;
    - Poisoning with 1080 baits. Generalised feeding with non-poisoned bait will be performed for several days prior to laying poisoned baits to attract animals.
    - Shooting is an opportunistic method, mostly used for control of small populations or individual problem animals.
    - Trapping in smaller areas to control remaining individuals from poisoning programmes.
- Rabbits (DAF, 2016b): An integrated control approach, combining different control methods in concert with land management practices, will be implemented to control Rabbits and includes:
    - Destroying (ripping) rabbit warrens. All warrens within 1 km of a permanent water sources will be ripped.
    - Baiting using 1080-sodium fluoroacetate or Pindone in the non-breeding season and when food sources are low. Pre-feeding should be undertaken to accustom Rabbits to the new food sources.
    - Trapping using a mix of cage traps and barrel traps, followed by humanly euthanising. Traps will be put in place and left open for 2-3 days to allow Rabbits to be accustomed to the trap before trapping begins.
    - Shooting as a means to target remaining individuals following other control measures. Shooting is most effective when rabbits are active (early afternoon, late afternoon or night).
- Feral Cats (DAF, 2016c): Control programs will be comprised of multiple methods, including night shooting, poisoning, trapping and fencing, combined with land management practices.
    - Shooting at night when Cats are foraging.
    - Poisoning using fresh meat baits containing 1080 (sodium fluoroacetate).
    - Rubber-jawed and leg-hold traps will be set at territorial markers such as faecal deposits and pole-clawing are present.
    - Trapping using a cage traps baited with meat or fish.

- Foxes: (DAF, 2016d): Control methods include shooting, trapping and baiting combined with land management.
    - Shooting used opportunistically to control small populations of problem individuals.
    - Trapping using paddled or offset laminated jawed traps are acceptable for use. Generally effective when done in conjunction with other control techniques.
    - Poison baits using 1080 and strychnine and fresh meat baits are an effective control strategy and can be distributed by hand, from vehicles or aircraft. Baits will be placed along tracks and fence lines, approximately 200-500 m apart and buried approximately 8-10 cm underground and covered with loose soil. Bating is best undertaken in spring followed by June/July when food demand is highest.

6.8 Weed Management

Several weed species were identified from the offset area and adjacent paddocks during the July and October 2020 field assessments. Of the weeds observed, five (5) are classified as category 3 Restricted Matters under the *Biosecurity Act 2014* and all five weeds are also classified as Weeds of National Significance and include the following. Several other species of invasive plants were also identified (refer to the offset Ecology Report in Appendix C).

- Rubber Vine (*Cryptostegia grandiflora*);
- Parthenium (*Parthenium hysterophorus*);
- Lantana (*Lantana camara*);
- Chinee Apple (*Ziziphus mauritiana*); and
- Velvety Tree Pear (*Opuntia tomentosa*).

These weeds and invasive plants pose a considerable threat to habitat quality in the offset area due to the increase in groundcover biomass and the risk of uncontrolled fires. The highest distribution of weeds and invasive plants were generally confined to areas of prior disturbance, riparian corridors, waterway and drainage lines and along existing access tracks.

Additional comprehensive surveys of the offset site will be undertaken in year 1 to determine distribution and abundance of weeds species. Results of these comprehensive surveys will inform the most appropriate species-specific weed control measures, location and timing for management activities. In general, however, weed management will be undertaken in accordance with the current management practices implemented at Mt Spencer Station.

General visual inspections will also be undertaken to monitor the distribution and abundance of weed species and invasive plants within the offset area. Weed infestations will be controlled and managed by preventing seed set and dispersal in accordance with Queensland's DAF recommended control measures. Species-specific control measures including timing of management activities will be reviewed by a suitably qualified ecologist on an annual basis based on the results of ongoing weed monitoring in the offset area.

For Mt Spencer Station, weed management will include spot spraying weeds within riparian corridors, waterways and drainage lines, and along existing access tracks and fence lines as well as mechanical removal and the strategic use of fire. Spraying will occur in the early dry season following periods of active growth. Strategic spraying of small isolated patches of invasive species will be undertaken and follow-up inspection and treatment will be implemented two to four weeks later if regrowth is evident, including mechanical removal of woody weeds. Woody weeds will be managed through a combination of herbicide and mechanical techniques.

Weed hygiene measures will also be implemented to prevent the movement of weed material into the offset area (Section 6.3). Prior to entering the offset area, all vehicles and equipment will be inspected for weeds, and will only be permitted access if approved by the landowner and accompanied by a weed inspection certificate. To further restrict the spread of weeds, vehicles will be restricted to designated access tracks.

Ongoing regular maintenance of firebreaks, roads and tracks will also help reduce the risk of weed incursion by preventing traffic into intact grasslands and other habitat for MNES.

7.0 Monitoring

Stanmore commits to implementing a monitoring program to assess the effectiveness of management measures outlined in Section 6.0 and to make timely decisions on corrective actions to ensure the performance criteria outlined in Sections 5.1 and 6.0 are achieved.

The monitoring methods are:

- Specific to the interim performance targets and competition criteria being assessed and will determine whether the performance criteria have been achieved or whether corrective actions are needed; and
- Quantitative and repeatable such that the monitoring assessments can be compared to each other which provides for changes between sampling events to be detected.

The overarching objectives of the monitoring program are to:

- Evaluate performance of the OMP against interim performance targets and competition criteria;
- Ensure management triggers are defined and can be detected;
- Develop and implement corrective actions when management triggers are detected;
- Inform subsequent reviews and amendments to the OMP and associated management plans.

7.1 General Site and Visual Inspections

Offset area inspection visits will be conducted at least biannually (prior to and following the wet season) by the land manager/offset area manager to inspect the offset area and assess the following:

- Fencing and signage condition (Note: fencing will be inspected every four weeks when stock are adjacent to the offset area);
- Evidence of excessive pugging or areas of overgrazing while stock are in the offset area;
- Condition of firebreaks;
- Fuel loads;
- Damage and/or degradation resulting from pest animal activity within the offset area;
- New weed outbreaks;
- Signs of unplanned fires; and
- Incidental fauna observations and any additional risks to offset values (i.e. evidence of predation of MNES)

7.2 Habitat Quality Monitoring Sites

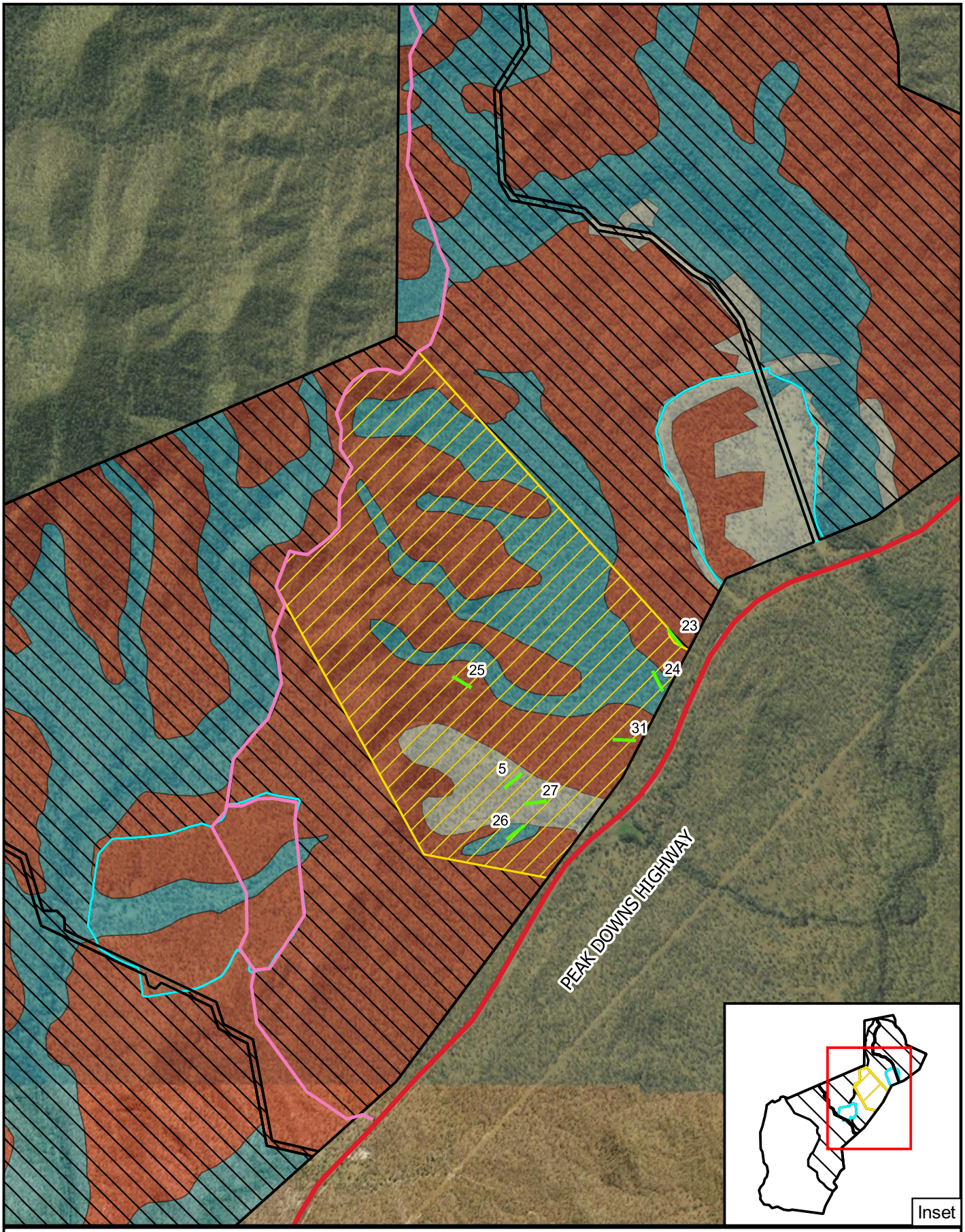
Permanent habitat monitoring sites within the offset area will be established. As a starting point, the July and October 2020 habitat quality surveys used seven (7) detailed survey locations within the IPE offset area, of which three (3) were in RE 11.12.1, two (2) in RE 11.3.4 and two (2) in non-remnant vegetation (see Figure 8). The final number and location of ongoing monitoring survey locations will be determined following approval of the offset area by DAWE and the suitably qualified ecologists that will undertake the detailed survey in Year 1. At least two additional monitoring sites will be included with location determine during the Year 1 survey. The final number and location of the survey sites (if they differ from the current habitat quality sites) be in accordance with Queensland guidelines and methodologies used in this OMP and aimed at having sufficient sample sites and spatial

coverage to assess any variation in condition across the offset area and effectively assess key habitat features for each offset matter.

All habitat monitoring sites will be used to assess habitat quality for all three MNES as relevant habitat overlaps where offsets for all three MNES are collocated. Each monitoring site will include a 100 m transect, with the start and central points to be marked with permanent markers (i.e. star picket) and the GPS location recorded. The final monitoring locations will be included in the first annual compliance report for the offset area. Photo monitoring will also be undertaken with photographs taken from north, south, east and west directions. All subsequent monitoring events will be undertaken at the same locations.

The permanent habitat quality monitoring sites will be utilised as part of the following monitoring activities:

- Habitat quality assessments undertaken in accordance with the Guide and the methods outlined in Section 4.1;
- Fauna assessments including bird surveys, spotlighting and Koala Spot Assessment Technique (SAT) surveys;
- Photo monitoring, undertaken at the ends of each of the habitat monitoring site transects;
- Presence of feral animals;
- Presence of weeds and invasive plants and
- Signs of fire.



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Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2021; QSPATIAL 2021; The State of Queensland (Department of Natural Resource and Mines) 2021;

Figure 8: Habitat Quality Transects within IPE Offset Area

Legend

- Existing Fenceline
- Highways
- Habitat Quality Transect
- Lot 4SP277438 Boundary
- Offset Investigation Area
- IPE Offset Area
- Holding Yards

Field Verified RE Mapping

- 11.12.1
- 11.3.4
- Non-Remnant

BASE/

7.3 Habitat Quality and Fauna Monitoring

Initial baseline habitat quality assessments were undertaken in July and October 2020. A comprehensive habitat quality and fauna assessment will be undertaken in year 1 during or immediately following the wet season, nominally March/April/May (depending on rainfall intensity, duration and accessibility), with subsequent assessments undertaken every five (5) years and then at the end of approval. Habitat quality and targeted fauna surveys will be undertaken to compare the offset against the interim performance targets and the completion criteria.

If habitat quality and fauna monitoring indicate a decline in habitat quality and/or a reduction in the abundance or distribution of the MNES in the offset area, monitoring may increase in frequency (e.g. every two years) until trends indicate an increase in habitat quality and/or abundance of the MNES.

The Guide will be used to assess habitat quality for each MNES and is based on the methodology set out in the BioCondition Assessment Manual and BioCondition benchmarks (Eyre et., al. 2015). A range of habitat variables are assessed using standard methods and compared to benchmarks (undisturbed) sites as a measure of how well a terrestrial ecosystem is functioning for biodiversity.

The guide allows for a habitat quality score to be calculated for each MNES based on three key indicators as outlined in Section 4.1 and include:

- Site condition: assessment of vegetation compared to benchmark (undisturbed) areas;
- Site context: a geospatial analysis of the assessment area in relation to the surrounding environment; and
- Species habitat index: the ability of assessment area site to support a species.

To assess habitat quality in line with the EPBC Offsets Policy, the attributes from the three indicators are used but partitioned as outlined in Section 4.1 which uses 15 attributes for site condition and 7 attributes for site context.

For inputs into the EPBC offsets calculator, species stocking rate as outlined in the EPBC offsets calculator guide, replaces species habitat index as a measure of the presence of a species at the impact and offset site. As recommended by DAWE to meet the requirements of the offsets policy, species stocking rate for this OMP is to be assessed on a scale of 0-4 as outlined in Section 4.1.

The habitat quality assessment will include targeted fauna surveys for the Koala, Greater Glider and Squatter Pigeon and will be undertaken in accordance with the relevant Survey Guidelines as outlined in Table 19. Fauna surveys as well as the habitat quality assessment will be undertaken by suitably qualified ecologists generally during the late wet season (nominally March/April/May) which corresponds to peak species activity and detectability. The habitat quality assessments will also include assessments of weed abundance and distribution and an assessment on the presence of pest animals.

Table 19 Survey techniques for MNES

MNES	Survey	Survey guideline
Koala	Direct observations: • Nocturnal surveys for Koalas will be undertaken using nocturnal spotlighting techniques described in the EPBC Act referral guidelines for the vulnerable Koala, which uses spotlighting to identify the	• Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et. al. 2018). • EPBC Act referral guidelines for the vulnerable Koala (DotE, 2014).

MNES	Survey	Survey guideline
	presence/absence of the species within the sampling area. Indirect Survey Methods • Surveys for Koalas will be undertaken using the Spot Assessment Technique (SAT) methodology (Phillips & Callaghan, 2001), which uses a tree-based scat sampling methodology to provide presence/absence data. • SAT surveys will be randomly throughout the offset area at each of the habitat quality monitoring sites. The exact number of survey sites will be determined by the suitably qualified expert and will be guided by the final offset area configuration. • The location of any tree scratches or observed koalas will also be recorded and photographed as part of the koala surveys or incidentally (Eyre et. al. 2014). • Where the presence of Koalas have been identified within the offset area either through direct survey or incidental observation, a minimum of two (2) 400 m x 50 m (i.e. two (2) ha) transects will be randomly established in proximity to the siting location. The final location, length and orientation of the transects will be determined by the suitably qualified expert. The number of Koalas encountered within each of the transect will be noted and converted to density/ha.	• Survey guidelines for Australia's threatened mammals (SEWPaC, 2011). • Spot Assessment Technique (SAT) methodology (Phillips & Callaghan, 2001). • Regularised, grid-based SAT (RGB-SAT) sampling (Biolink Ecological Consultants, 2008).
Greater Glider	• Nocturnal spotlight searches will be conducted over a minimum of five (5) survey days and nights during periods of known peak activity (wet season) around suitable habitat including tree hollows and riparian areas. • Greater Glider scats observed during the Koala SAT surveys will also be recorded. • Searches will be undertaken along designated transects determined through field survey and identified as potential habitat for the species. Nocturnal surveys will record the presence of Greater Gliders within 25 m of the centre line (i.e. 50 m wide). The transects will be	• Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et. al., 2018). • Greater Glider Survey Standards (MacHunter et. al., 2011)

MNES	Survey	Survey guideline
	traversed slowly with approximately 100 m traversed every 10 minutes. • Where Greater Gliders have been identified within the transects, the number of Greater Gliders encountered will be noted and converted to density/ha. • Nest box utilisation will be determined from visual inspection of all nest boxes and generally undertaken using a camera attached to an extendable pole.	
Squatter Pigeon	• Surveys will be undertaken over a minimum of 3 days during the breeding season (between Spring and Summer). In accordance with the Survey Guidelines for Australia's Threatened Birds squatter pigeons will be passively surveyed by flushing them while traversing by vehicle and on foot. The number and abundance of Squatter Pigeons will be recorded during survey events. • Squatter Pigeon densities will be determined from ten (10) 50 m x 10 m transects by converting numbers to density/ha.	• Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et. al., 2018). • Survey guidelines for Australia's threatened birds (DEWHA, 2010).

Where the habitat quality assessments do not demonstrate improvements in each of the individual site condition and site context attributes, and the overall habitat quality/interim performance targets and/or the completion criteria for the offset area, the adaptive management framework allows for a review of management actions and corrective actions to be undertaken to assess if additional management measures or corrective actions are required. If the review deems additional actions are required, the OMP will be revised and approval of the revised OMP sought from the Minister.

As outlined in Table 17, a period of 20 years has been chosen as the time period of which the final habitat quality, and hence, increased habitat values of the MNES will be reached (i.e. 2040-2041). This time period was chosen as 20 years is the nominated time until ecological benefit used in offsets calculations and is the time required for large canopy trees to become established and for additional tree hollows to form. Habitat quality site assessments are scheduled every five (5) years through to the end of the approval. The final assessment will be undertaken in approximately 2040-2041 (depending on the length of the approval) to demonstrate that the final habitat quality of the offset area conforms to that outlined in this OMP and that the competition criteria has been achieved.

Where the overall habitat quality score identified in the offset calculator (i.e. 'Habitat Quality with Offset') and shown in Tables 11-13 is not achieved by the end of the approval, management actions will continue until the offset requirements are realised. In contrast, if the completion criteria are met prior to the end of the approval, all management actions and monitoring will continue until the end of the approval to ensure the completion criteria and habitat quality is maintained throughout the life of the approval.

7.4 Supplemental Habitat Features

Monitoring of the installed watering point will be undertaken during all site surveys and inspections including the five yearly detailed habitat quality surveys and during routine land management as detailed in Section 8.3. Visual inspection will include checking for leaks from pipes or tanks and confirming any pumps are functional and working as intended.

Monitoring of nest boxes is crucial to assessing utilisation and occupancy success and to ensure the installed boxes are functional. Nest boxes will be visually inspected twice yearly prior to and following the wet season. Visual inspections will also be undertaken following severe weather events that could destroy the boxes such as fire or cyclones. Inspections will be undertaken using a pole mounted camera or direct access via a ladder. Evidence of the presence of Greater Gliders as well as other observed species will be recorded and reported to the Department.

7.5 Photo Point Monitoring

Photo monitoring will be undertaken at each monitoring location during the habitat quality assessments to allow habitat changes to be visually assessed over time. Photos at each photo monitoring point will be taken in a north, east, south and westerly direction. A permanent feature will be included within the photo frame to provide a fixed reference point. A record of the photographs will be maintained, including GPS location, date, time, direction and the height above the ground at which the photograph was taken. Data from habitat quality assessments and photo monitoring will be recorded on survey sheets and these will be attached to annual monitoring reports.

7.6 Weeds

The offset area will be monitored for weeds and invasive plants and will include a comprehensive weed survey in year 1 which will map the distribution and density of weed infestations in the early dry season. The final mapping methodology will be determined by the suitably qualified ecologist prior to and during the comprehensive year 1 surveys. Ongoing seasonal weed monitoring surveys will be undertaken in conjunction with the habitat quality monitoring surveys outlined in Sections 7.2. Comprehensive weeds surveys aimed at re-mapping the distribution and density of weed will be undertaken every five (5) years.

Assessing the presence and abundance of weed cover will be done in accordance with the methodology outlined in the Guide for assessing non-native plant cover (DES, 2017). Briefly, this method involves establishing a 50 m x 10 m plot and dividing this plot into 20 smaller 5 m x 5 m sub-plots. Percent (%) weed cover will be assessed in each of the 20 sub-plots and the total percent weed cover determined by taking the average from the 20 plots. Photo monitoring will also be undertaken within each plot in the same manner described in Section 7.5.

In addition to the permanent weed monitoring sites, incidental observations will be recorded from the offset area during general observations during routine land management. This will provide instances of weed infestations that occur away from the permanent weed monitoring sites. If trigger levels for weeds are met or exceeded, additional monitoring will be undertaken and will occur in conjunction with appropriate weed management measures outlined in Section 6.8, until the presence and distribution of weeds reduces to baseline levels or below.

7.7 Feral Animals

The offset area will be monitored for pest animals and will include a comprehensive survey in year 1 which will map the presence of feral animals. Ongoing feral animal monitoring surveys will be undertaken in conjunction with the habitat quality monitoring surveys outlined in Sections 7.2 and 1.1 and at the same survey locations as the habitat quality assessment

surveys in Figure 8 as well as additional sites established during the Year 1 monitoring event as outlined in Section 7.2. Monitoring will primarily entail standardised timed visual observations in a similar manner undertaken for bird surveys as well as camera trap monitoring and nocturnal spotlighting surveys. Evidence of faecal samples and damage cause by pest animals will also be recorded. The final methodology will be determined by the suitably qualified ecologist during the initial comprehensive survey in year 1. Exact monitoring methods will be determined by the suitably qualified ecologist engaged to undertake the monitoring.

Feral animals will also be opportunistically surveyed throughout the year outside of monitoring times, including observations for potential new pest animal species that have not been previously recorded, and which are known to prey on MNES and/or degrade MNES habitat (e.g. Feral Pigs). Any evidence of mortality or injury to MNES as a result of pest animals will also be recorded during the surveys. If trigger levels for any pest animal species are met or exceeded, additional monitoring will be undertaken and will occur in conjunction with appropriate feral animal management measures until pest animal presence reduces to baseline levels or below.

7.8 Fuel Loads

Fuel load monitoring for fire management will be undertaken annually in the early dry season when biomass (i.e. ground cover) is at its greatest, to determine the risk of fire to the offset site and to inform fire management strategies. Groundcover will be monitored at the same permanent habitat quality monitoring sites established as part of the comprehensive baseline surveys in year 1.

Fuel loads will be managed through strategic grazing events if the percent cover of native grasses exceeds 55%. For strategic grazing, the cattle stocking rate will be determined by the percent ground cover vegetation and native grass cover in particular as outlined in Table 18.

8.0 Data Management, Reporting, Implementation and Auditing

8.1 Data Management

Stanmore or their authorised representative, will be responsible for overseeing and managing the monitoring activities required as part of this OMP. This will include maintaining data records as per the requirements of Condition 16 of the EPBC Act approval which states that accurate records substantiating all activities associated with or relevant to the conditions of approval must be maintained including measures taken to implement management plans required by the approval. If required, these records must be made available to DAWE upon request.

8.2 Reporting

The results of the monitoring activities will be documented by suitably qualified ecologists in stand-alone progress reports and combined into an annual compliance report as required by Condition 17 of the EPBC Act approval. The annual report will be provided to DAWE within three months of the 12-month anniversary of commencement of the action and be published on Stanmore's website. All reports must remain published for the life of the approval (e.g. 1 November 2040).

A reporting schedule is shown in Table 21 and this process will enable assessment of changes in vegetation condition/habitat quality relative to baseline data and determine progress towards the offset completion criteria (see Section 5.1). Reporting will also determine the success of the management actions and note any changes due to climatic conditions and will inform the type and frequency of management measures required in the upcoming monitoring period.

The results of the monitoring activities will be documented by suitably qualified ecologists in stand-alone progress reports and combined into an annual compliance report.

The reports will include the following information:

- EPBC approval number;
- General description of the climatic conditions for the monitoring period (e.g. rainfall, duration of the wet season etc.);
- All activities undertaken during the monitoring period including monitoring undertaken and the entity who undertook the monitoring and results of the monitoring undertaken;
- Location (GPS coordinates) and details of all confirmed sightings of Greater Glider, Koala and Squatter Pigeon identified during surveys and monitoring;
- Location (GPS coordinates) and details/condition of water points and nest boxes (including use of nest boxes and by what species);
- An indication of whether any additional risks/threats over and above those outlined in the final approved OMP are apparent and management actions to be employed to manage those risks;
- If any triggers were detected, and if so, the corrective actions that were implemented;
- Discussion on progress towards achieving the management objective and offset obligations outlined in the OMP;
- Recommendations for improving/updating the OMP in accordance with adaptive management.

8.3 Implementation

Following approval, the OMP will be implemented and will be remain effective for the life of the Project. Stanmore commits to legally securing the environmental offsets within three (3) years from the commencement of clearing habitat for the MNES outlined in Table 1 of this OMP. Stanmore commits to commencing components of this OMP (e.g. year 1 baseline monitoring) of the offset area following approval of this OMP and prior to formal legal security if agreed by the landowner and Stanmore.

The schedule of monitoring activities is shown at Table 20 and the schedule of reporting is shown at Table 21.

Table 20 Proposed monitoring schedule of offset area

Monitoring Type	Monitoring Attributes	Monitoring Frequency	Monitoring Method	Monitoring Locations
Habitat Quality surveys undertaken by suitably qualified ecologists				
Initial habitat quality assessment	Site condition, site context and species stocking rates as outlined in this OMP.	Initial and baseline assessment was completed in July and October 2020.	Visual inspections and detailed habitat quality assessment as per the Guide and as outlined in this OMP.	Assessment sites outlined in Section 7.2.
Ecological Condition	Recruitment of woody perennial species in the ecologically dominant layer (EDL)	Year 1 (following approval of this OMP and securing the offset area), then every 5 years until the end of the approval.	As per the methods outlined in the Guide and in Section 4.1. Visual observations and where relevant, methods outlined in the Guide to determining terrestrial habitat quality and with reference to interim criteria as per Table 17 for the relevant RE and AU being monitored.	
	Native plant species richness – trees			
	Native plant species richness – shrubs			
	Native plant species richness – grasses			
	Native plant species richness – forbs			
	Tree canopy height			
	Tree canopy cover			
	Shrub canopy cover			
	Native perennial grass cover			
	Organic litter			
	Large trees			
	Course woody debris			
	Non-native plant cover (i.e. weeds)			
	Quality and availability of food and foraging habitat (e.g. tree canopy height and cover,			

Monitoring Type	Monitoring Attributes	Monitoring Frequency	Monitoring Method	Monitoring Locations
	organic litter, tree and shrub species richness).			
	Quality and availability of shelter (e.g. presence of tree hollows).			
Site context[9]	Threats to species (e.g. lack of EDL recruitment, presence of feral animals and weeds etc.).			
	Threats to mobility capacity.			
Species stocking rates/targeted fauna surveys for the MNES	Presence/absence of MNES. MNES abundance and density (where relevant).	Every five (5) years until the completion criteria have been achieved. The survey frequency is justified as changes to vegetation communities and ecosystems and the fauna that inhabit those communities takes time and is generally a relatively slow process.	Refer to 4.1.	Refer to Section 4.1.
Nest boxes	Presence of Greater Gliders and functionality of each box.	Twice yearly for the first 5 years then yearly until the end of the approval.	Refer to Section7.4	At nest box locations[10]
Visual inspection surveys undertaken by the landowner or authorised landowner representative and targeted weed and feral animal surveys undertaken by suitably qualified ecologists.				
Photo points	General vegetation condition and vegetation cover.	Year 1 (following approval of this OMP and securing the offset area), then every 5 years until the end of the approval.	Photographs of offset area to be taken from the same location and direction for each monitoring event.	Assessment sites outlined in Section 7.2.

[9] Non-GIS attributes that can be measured in the field.
[10] To be determined during the year 1 comprehensive survey.

Monitoring Type	Monitoring Attributes	Monitoring Frequency	Monitoring Method	Monitoring Locations
Grazing	Stocking rates, ground cover and fencing.	Stocking rates will be routinely monitored until the end of the approval. Biomass will be monitored annually in the early dry season. Fencing will be monitored during routine land management of the offset area and at least quarterly.	Assessments of the offset area will be undertaken by the landowner/land manager or authorised representative to observe and record grass cover, presence of weeds and pest animals, evidence of fire and evidence of unauthorised access. Fire break and fence maintenance activities will be recorded for inclusion in the annual report. Any unplanned fires will also be recorded as well as monitoring results for any planned cool or mosaic burns on habitat. Weed cover will be recorded as per the Level 2B methodology described in the Land Manager's Monitoring Guide (DERM, 2010) (or any subsequent published version of this document or similar recognised methods). This methodology is suitable for landowners to rapidly assess whether weed management measures need to be conducted within the offset area. Detailed assessments as outlined in Section 7.0 will also be undertaken in conjunction with the habitat quality assessments.	Throughout the offset area.
Fire	Presence of fire and extent of burning. Condition of fire breaks.	At least quarterly and following known fire events. Biomass will be monitored annually in the early dry season.		
Feral animals	Presence of pest animals, control measures undertaken and success of the control measures.	Visual inspections undertaken during routine land management. Year 1 (following approval of this OMP and securing the offset area), then every 5 years until the end of the approval.		
Weeds/ pest plants	Presence of weeds, control measures undertaken and success of the control measures.	Visual inspections undertaken during routine land management. Year 1 (following approval of this OMP and securing the offset area), then every 5 years until the end of the approval.		
Fencing and site access	Condition of fencing and access tracks.	Visual inspections undertaken during routine land management.		
Unauthorised impacts to vegetation from activities such as illegal	Unauthorised clearing or disturbances.	Visual inspections undertaken during routine land management and undertaken at least quarterly.	Observe and record accessibility to the offset site (i.e. condition of fencing), evidence and location of illegal clearing, fire and/or pest animal incursion.	Throughout the offset area and particularly along and adjacent to the road licence easement and the

Monitoring Type	Monitoring Attributes	Monitoring Frequency	Monitoring Method	Monitoring Locations
harvesting and illegal access.				boundary to the Epsom State Forest.
Cyclone events	Condition and damage to vegetation and any dead or injured fauna.	Following cyclones or large tropical rainfall events.	Visual throughout the offset area.	Throughout the offset area.

Table 21 Proposed reporting schedule of offset area

Report	Reporting period	Responsibility	Submission period
EPBC Act Annual Compliance Report which will report on compliance with the EPBC Act approval.	Every 12 months for the duration of the approval or until otherwise advised by the Minister	Stanmore	Within 3 months of every 12 month anniversary of the commencement of the action.
Offset Area Report that will outline the results and the effectiveness of the management actions outlined in this OMP. This report will include all monitoring results, management actions, investigations and any corrective actions taken.	Every 12 months from approval	Generally, Stanmore but with inputs from relevant suitably qualified persons and/or the landowner.	The report will be an appendix to the Compliance Report
Ecological Condition Assessment Report that provides results of the habitat quality surveys.	In year 1 and then every 5 years from the approval for the life of the approval	Suitably qualified person.	The report will be an appendix to the Compliance Report
Internal Audit Report that confirms compliance and effectiveness of the OMP. This report will also provide any necessary corrective actions of management action improvements.	In year 1 and then every 5 years from the grant of the V-Dec for the life of the approval.	Stanmore	Within 3 months of the submission of the Ecological Condition Assessment Report
External Audit Report confirming compliance with the approval conditions.	As and if required by DAWE	Generally, Stanmore but with inputs from relevant suitably qualified persons.	As and if required by DAWE
Revised OMP as approved by the Minister, to document any required changes to the management actions of the offset area due to the interim habitat quality values or completion criteria not being met.	Only required if the management actions in the OMP needs to be amended to ensure the interim and/or completion criteria are met, or should additional offsets be required in the event that completion criteria cannot be achieved.	Stanmore	Within 6 months of failing to meet the interim habitat quality values or completion criteria where the management actions require amending.
Notification of illegal timber harvesting or clearing to the relevant Queensland Government Departments and Queensland Police (as relevant).	Only required if illegal clearing or timber harvesting occurs within the offset area	Stanmore.	Within 10 business days of detection of illegal timber harvesting or clearing.

8.4 Auditing and Review

Internal audits/reviews of management and monitoring activities will be undertaken in response to a trigger for further action (outlined in Table 18) being triggered and non-compliances with the OMP requirements. External auditing will be undertaken as required by the approval conditions and will be published in annual compliance reports that will include details on the progress towards achieving the interim performance targets and/or completion criteria specified in this OMP.

In accordance with Condition 17 of the EPBC Act approval, Stanmore must publish an annual compliance report that will include details on the progress towards achieving the interim performance targets and/or completion criteria specified in this OMP.

The effectiveness of actions within this OMP will be reviewed annually and amended (if required) to incorporate changes identified through management activities and monitoring activities. Any changes to this OMP, including but not limited to monitoring and management measures must be approved in the form of a revised OMP by the Minister, prior to implementing changes to practices. Changes may include amendments to management actions, identification of additional monitoring activities and responses to adaptive management triggers. If the completion criteria have been attained prior to the end of the approval, the OMP will continue to be implemented and reviewed to ensure the completion criteria are maintained until the approval expires (2040).

9.0 Risk Assessment

A risk assessment was undertaken using the risk assessment process provided by the DAWE to assess the risks associated with failing to achieve the objectives outlined in this OMP for mitigating impacts to MNES. For each identified risk, the potential consequence of the risk (Table 22) was assessed against the likelihood of that risk occurring (Table 23) to determine an overall risk rating using the matrix in Table 24. The consequence and likelihood of each risk occurring was reassessed following the implementation of the management and mitigation measures (i.e. control measures) to provide a residual risk rating (Table 25).

Table 22 Consequence classification

Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor (Mi)	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate (Mo)	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High (H)	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major (Ma)	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical (C)	The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.

Table 23 Likelihood classification

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely (Hi)	Is expected to occur in most circumstances.
Likely (L)	Will probably occur during the life of the project.
Possible (P)	Might occur during the life of the project.
Unlikely (U)	Could occur but considered unlikely or doubtful.
Rare (R)	May occur in exceptional circumstances.

Table 24 Risk rating matrix

		Consequence				
Likelihood		1. Minor	2. Moderate	3. High	4. Major	5. Critical
	5. Highly Likely	Medium	High	High	Severe	Severe
	4. Likely	Low	Medium	High	High	Severe
	3. Possible	Low	Medium	Medium	High	Severe
	2. Unlikely	Low	Low	Medium	High	High
	1. Rare	Low	Low	Low	Medium	High

For the purposes of this risk assessment, the risk levels are defined as follows:

- Severe: Unacceptable risk that must not proceed until suitable and comprehensive control measures have been adopted to reduce the level of risk.
- High: Moderate to critical consequences. Works should not proceed without considerations of additional actions to minimising the risk.
- Medium: Acceptable with formal review. Medium level risks require active monitoring due to the level of risk being acceptable.
- Low: Acceptable with active management not considered required.

Table 25 Risk assessment and management

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
Standard Risks												
Habitat or vegetation loss through unplanned clearing	As the offset site occurs within a beef production property, it is possible for unplanned/ illegal clearing to occur. This is unlikely as the landholder will enter into an offset arrangement with the approval holder. Clearing can also occur by vehicles traversing the area off designated roads/tracks This is also considered improbable as access to the	U	Mj	H	No unapproved and/or intentional clearing of vegetation within the offset area, except for clearing that is required for fencing, access, firebreaks or public safety. Ecological thinning may be carried out, but only in accordance with the advice of a suitably qualified expert and only after approval by the Department.	R	Mj	M	No unauthorised access. No evidence of clearing within the offset area. Offset Area is mapped as Category A on PMAV.	Any activities that are in contravention of the Voluntary Declaration. Detection of prohibited clearing outside of established access tracks, fire control lines and fence lines (existing infrastructure).	Upon being notified or becoming aware of clearing outside of existing infrastructure, the landholder is to assess how any unauthorised clearing occurred and, where relevant, any unauthorised persons accessed the site Report breach to the Department within 10 business days. Review existing access	Monitoring and inspections will monitor and document if there is evidence of recent illegal clearing. Monitoring will also document vegetation clearing that has occurred for fire break, access road or fence line maintenance.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
	site will be restricted. Potential unplanned clearing could come from application of chemicals on adjacent properties which stray across the offset site boundary.										restrictions and inspect signage and offset area fencing within one fortnight of detection of the clearing. Any corrective action identified will be implemented within 1 month of the OMP being updated.	
Timber harvesting /collection	Unauthorised access to the offset area may result in timber harvesting/ collection. Such actions can remove important habitat features and harm the structure of the vegetation communities and habitat for	U	Mo	L	All signs and fences will be erected within three months of the offset being legally secured. Signs will be erected at all entrances and potential access points to the site identifying the area as an environmental offset and	R	Mo	L	No unauthorised access to the offset site. No evidence of unapproved clearing within the offset area. Offset area mapped as Category A on PMAV.	Damaged fences associated with vehicle access. Detection of prohibited forestry operations, native timber harvesting or clearing outside of established access tracks, fire control lines and fence lines	Upon being notified or becoming aware of prohibited forestry operations, native timber harvesting or clearing outside of existing infrastructure, the landholder is to assess who and how unauthorised	The annual compliance report will document any illegal/unauthorised timber harvesting. All field monitoring will report on the presence of any unauthorised access and clearing.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
	the Koala, Greater Glider and Squatter Pigeon.				stating that access to the site is forbidden. Fences will be maintained to prevent unauthorised access, to minimise incursions by feral herbivores and to control stock presence					(existing infrastructure).	persons accessed the site Report breach to the Department within 10 business days. The approval holder is to reassess access protocols for any lessees etc., signage and general access within one fortnight.	
Control invasive weed species to reduce impacts on MNES.	Infestation of previously unidentified weeds within the offset area. Expansion of range and abundance of existing weed species within the offset site.	P	H	M	Access to site will be restricted to authorised persons. Weed management and weed hygiene restrictions will be implemented across the offset	U	Mi	L	No infestations of new species in the offset area, covering more than 100m². No increase in the average percent (%) cover score weed species from baseline and/or previous monitoring events. Outbreak of infestations of weed species not	An increase in the average percent (%) cover score weed species from baseline and/or previous monitoring events. Outbreak of infestations of weed species not	Review adherence to weed hygiene procedures to ensure compliance and to update restrictions where required. Review timing and frequency	Monitoring of weeds and non-native plants will be undertaken during the habitat quality assessment surveys using the same methodology used to the baseline habitat

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
	Left unchecked, weed invasion and proliferation could cause significant deterioration of the offset site.				site to reduce the extent of existing weeds and to control the potential introduction of new exotic weed species. Weed hygiene and management will be undertaken in consultation with the landowner. Chemical and/or mechanical control of all declared weeds in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets or other sources of information.				from baseline and/or previous monitoring events.	previously recorded in the offset area during baseline and/or previous monitoring events. An increase in the presence of weeds (relative abundance and/or area of occurrence) from photo monitoring results. An interim performance target is not attained, or a completion criterion is not attained and/or maintained.	of weed management measures, and implement alternative weed management timeframes as required. Investigate alternative weed management control actions (e.g. spot spraying and/or injection of herbicides, as well as intensification for most affected areas) and implement as required. Undertake additional weed control measures and continue until weed cover is below baseline	quality as outlined in the DES Guide to Determining Terrestrial Habitat Quality, as well as incidental observations as part of routine management. The annual report will document the weed presence, weed control measures and extent of weed cover during the reporting period and relevant responsive actions.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
											levels and in accordance with performance criteria. Update OMP as required.	
Inappropriate grazing regimes	Inappropriate cattle grazing destroys shrubs and native grass cover and slows or reverses the regeneration of threatened fauna habitat. Grazing can also lead to the trampling of Squatter Pigeon (southern) nests, impairing breeding.	P	H	M	Stock will be managed in accordance with Section 6.5. If and where new fencing is required to demarcate the offset area, ensure fencing is permanent and prohibit unintended grazing by cattle. Squatter Pigeon breeding period can vary depending on localised site conditions but generally peaks	U	Mi	L	Stock are removed from the offset area for it to be spelled in accordance with the current land management practices undertaken on Mt Spencer Station to allow for grasses to seed and to facilitate recovery of perennial grasses and the herbaceous layer while mitigating wildfire risk by	Stock are observed on site in exclusion times, outside of strategic grazing events. Livestock located in Squatter Pigeon breeding habitat during breeding season. Damaged fencing is observed Habitat Quality assessments indicate native grass groundcover is <30% or >55%. If ecological surveys indicate an extended or	Amend livestock management practices including amendment of stocking rates, and/or timing, and/or duration and/or frequency of strategic grazing events until native grass cover is >30% or <55%. Repair offset area boundary fencing if damaged. Remove stock from Squatter	Regular site inspections by landowner during exclusion periods as well as to assess for signs of overgrazing and pugging. Regular inspections of the offset area will be undertaken during normal land management and farming practices to examine fence lines when stock are grazing in the offset area

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
					in the early to mid-dry season (May-July). Grazing will be restricted at least during the peak Squatter Pigeon breeding and egg laying periods in the early to mid-dry season.				restricting fuel loads. Ground cover always remains above the minimum cover limits. Native grass groundcover is <30% or >55%.	varied peak breeding period outside the early to mid-dry season.	Pigeon breeding habitat. Removing stock when excessive pugging or overgrazing is observed such that native grass cover is <30%. Construct additional fencing if required. Additional fencing will not clear areas of MNES habitat. Should monitoring activities identify triggers for further action, the OMP will be reviewed by a suitably qualified ecologist within one month and	and/or adjacent to the offset area. Habitat quality assessments will be undertaken in accordance with this OMP and will include assessment of percentage cover of native perennial grasses The annual offset compliance report will document vegetation condition.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
											update if required. Any corrective action identified will be implemented within 1 month of the OMP being updated.	
Increased population of feral animals in the offset area causing habitat degradation or direct impacts to MNES	Pest animals pose threats to the MNES including predation (Wild Dogs, Feral Cats and Foxes) and habitat degradation (Feral Pigs, Feral Horses and Rabbits). Feral Pigs and rabbits can impact on Koala habitat including tree species recruitment and understorey	P	H	M	Pest animal management will be undertaken in consultation with the landowner and in accordance with general pest management processes. Pest management will include a range of best management practice actions including shooting, trapping, fencing	P	Mi	L	No increase in abundance of feral animals. Maintain pest animal control program. No evidence of new pest species.	Observed increase in sightings/signs and/or the relative abundance of pest animals above baseline levels and/or previous monitoring event (whichever is lower). Observation of, or signs of, a feral animal not identified as occurring within the Project area	Review adherence to pest animal management. Investigate potential sources or reasons for an increase in pest animal numbers and rectify Increase the frequency or revise the type of invasive pest animal control efforts in accordance with DAF guidelines,	Review adherence to pest animal management actions. Investigate potential sources or reasons for an increase in pest animal numbers and rectify. Increase the frequency or revise the type of invasive pest animal control efforts in accordance with

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
	vegetation composition.				and baiting, and will be undertaken in accordance with Queensland's Department of Agriculture and Fisheries (DAF) guidelines[11] and the requirements of the *Biosecurity Act 2014.* If an increase in feral pest species is noted, additional pest management/control measures will be instigated until the increased					during the baseline surveys. Habitat quality scores for interim performance targets are not achieved by Year 5, Year 10, Year 15 and Year 20.	and in conjunction with neighbouring landowners. Update OMP if required.	DAF guidelines, and in conjunction with neighbouring landowners. Suitably qualified ecologist to review the OMP within one month and update if required

[11] https://www.daf.qld.gov.au/business-priorities/plants/weeds-pest-animals-ants

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
					activity has ceased.							
Unauthorised access	Access to the offset site by any unauthorised persons poses risks to the MNES through habitat degradation (introduction of new weeds), incursion by feral herbivores if gates are left open, MNES mortality through vehicle strike.	P	Mo	M	All signs and fences will be erected within three months of the offset being legally secured. Signs will be erected at all entrances and potential access points to the site stating that access to the site is forbidden. Fences will be maintained to prevent unauthorised access, to minimise incursions by feral herbivores and to control stock presence.	U	Mo	L	No unauthorised access to the offset site.	Evidence of unauthorised or unplanned access by persons, vehicles, and/or stock is detected during exclusion periods. Evidence of stock is detected at any point during exclusion times. Damage is detected to any fence or sign.	Upon being notified or becoming aware of prohibited access to the offset area, the approval holder is to reassess access protocols for any lessees etc., signage and general access within one fortnight. Damage to signage will be repaired within one month of noting the damage. If there are areas that have been negatively impacted by unauthorised access, the	Monitoring of fence lines will be undertaken by the Landholder or suitable qualified person appointed by the approval holder within 3 months of the offset area being legally secured and during quarterly inspections. Inspections will monitor and document damage or loss of signs and evidence of unauthorised access to the offset area.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
											regeneration of those areas will be added to the ongoing monitoring sites. Signage will be repaired and maintained as required by the Landholder or suitable qualified person appointed by the approval holder.	
Bushfire (unplanned)	If unchecked bushfire may degrade some or all of the offset site and increase related risks such as erosion. Fire late in the management period would also reduce the environmental improvement	P	H	M	Controlled burns will be undertaken in consultation with the landowner and in accordance with the recommended fire management guidelines for Regional Ecosystems and will involve a	U	H	M		Unplanned fire within the offset area. Planned fires become out of control or the required burning regime is not achieved. Habitat Quality assessments indicate native grass	Occurrences of fire are to be recorded during the visual inspections undertaken during routine land management. If an uncontrolled bushfire has impacted the offset area (including if	Fire breaks are to be inspected annually in September Visual inspection of signs of fire during routine land management and during the habitat quality assessments.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
	achieved at the offset site.				range of burn strategies including patchwork burns. Fire is to be excluded from the offset area except for planned and strategic burns as required to reduce understorey fuel loads having a detrimental impact on canopy tree recruitment and establishment and to maintain existing fire breaks. Create firebreaks around the offset area boundary to minimise unplanned fire					groundcover is >55%.	controlled burning becomes out of control), review the grazing management and fire management strategies and adherence to these strategies and exclude cattle for at least three-six months (depending on conditions for re-growth). All fire breaks will be inspected, maintained, and repaired if required. To ensure compliance, with performance criteria, undertake remedial action including:	Fuel loads will be monitored through monitoring of ground cover and to inform fire management strategies.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
					from adjacent lands. Firebreaks are to be co-located, where possible, with roads, fence lines and vehicle access tracks. No areas of MNES will be cleared unless necessary for safety management.						•Alteration to stocking rates, and/or duration and frequency of strategic grazing events; and/or •Amendments to fire management practices as required including fire safety and containment management. Suitably qualified ecologist to review the OMP within one month and update if required.	
Offset fails to achieve the interim performance targets and	The offset site has not met the requirement of the offset policy or this OMP, nor	R	C	H	The Voluntary Declaration under the VM Act will ensure that the	R	Mo	L	Completion criteria are achieved, by the timeframes established and	Interim performance targets are not	Within one month of detection of the trigger, complete an	Monitoring of the offset area will be undertaken in

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
completion criteria within the 5, 10, 15 and/or 20-year time intervals. Offset site initially achieves the completion criteria but declines before the end of the approval.	achieved the outcomes that were key to the rationale for the approval decision.				landholder remains obliged to undertake active management of the offset until all completion criteria are achieved, leading to further management.				through to the end of the approval.	achieved by year 5, 10 or 15. Completion criteria are not achieved by year 20.	investigation into the reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. This investigation must re-evaluate the suitability of the relevant management actions and identify appropriate corrective actions. As soon as practicable, and within six months of detection of the trigger, implement revised corrective	accordance with this OMP. Monitoring results will be compared against the interim performance targets and completion criteria to assess progress of offset area in achieving the requirements of this OMP.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
											actions. These may include (but not limited to): • Increasing the frequency and intensity of pest animal and weed control measures or revising the type of measures to be implemented. • Modify fire management measures, to better support enhancement of offset values. • If the investigation outlined	

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
											above requires changes to the management actions, then as soon as possible, and within six months of detection of the trigger, implement a revised OMP as approved by the Minister, incorporating those recommended changes. • Additional offsets will need to be sought by the approval holder, and approved by	

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
											the Minister, should the above corrective actions not be successful.	
Force Majeure Events												
Drought	The risk posed by drought is a decrease in groundcover, an increase in the likelihood of unplanned fire due to the dry conditions from lightning strikes and an increase in weed cover when rainfall is received. Reduced/ retarded plant growth may would be expected, depending on the severity of	P	Mo	M	Limited mitigation measures can be implemented. Should the offset be deemed by the approval holder or the Department to have been delayed, all parties will work together to determine to determine an appropriate response.	P	Mo	M	Achievement of 20-year completion criteria.	Drought declaration.	Allow offset area to recover post drought, particularly through the control of weeds as per Section 6.8. Exclude stock grazing until groundcover improves to >55% immediately prior to the annual grazing period. Within one month of determining that	The annual offset compliance report will document vegetation condition and report on drought impacts.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
	drought. This may prevent affect achieving interim performance targets or the completion criteria within the 20-year period.										the outcomes of the OMP are likely to be delayed, consultation between Stanmore, the landowner and DAWE will be undertaken to develop an appropriate response.	
Cyclone/ severe tropical lows/ flooding	The most significant impact from tropical cyclones or tropical lows is typically flooding and destruction of habitat. The season for such weather events is between December and April.	L	Mo	M	Limited mitigation measures can be implemented. Part of the offset site is relatively flat and may experience flooding from the nearby waterways. However, cyclones and severe tropical lows are relatively	L	Mo	M	The subsequent monitoring event (as per Section 7.0) will include habitat quality surveys and supplemented habitat features assessments, as soon as is safe and reasonably practicable to do so following any cyclone or flood. Appropriate weed	Any incident of cyclone or flood impacting the site.	As soon as reasonably practicable and safe following the cyclone or flood, undertake a monitoring event as per Section 7.0 and implement management measures as required. This may include additional planting of fauna habitat trees as	The annual offset compliance report will document vegetation condition and report on cyclone/ flood impacts.

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
					infrequent (although likely to occur at some point during the life of the offset). Although flooding is not expected to be of sufficient duration, wind speed has the potential to be severe and may to cause substantial long-term harm to the site. Additionally, the increased availability of soil moisture following flood is expected to increase the growth rates of vegetation, and thus facilitate repair to damage to vegetation,				management measures will be implemented, as required.		determined by suitably qualified ecologists.	

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood[1]	Consequence[2]	Result[3]		Likelihood[1]	Consequence[2]	Result[3]				
					following subsidence of flood waters. Increased soil moisture may assist weed growth. The subsequent monitoring event (as per Section 7.0) will include groundcover survey to detect any areas of increased weed density.							

[1] Hl - Highly Likely; L - Likely; P - Possible; U - Unlikely; R - Rare

[2] Mi - Minor; Mo - Moderate; H - High; Mj - Major; C - Critical

[3] L - Low; M - Medium; H - High; S - Severe

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Appendix A

Suitably Qualified Persons

Dr Craig Streatfeild

Principal Environmental Scientist

Craig is a Principal Environmental Scientist with over 20 years' experience in providing leadership and technical expertise in environmental impact assessments, environmental legislation, permitting and approvals, preparation of environmental management plans and environmental management, monitoring and compliance. Craig has also been responsible for fauna and flora assessments and mitigating impacts to fauna. He has undertaken training in quality, environmental management and health and safety systems auditing, erosion and sediment control and conflict resolution.

Craig has extensive experience with environmental approvals and permitting under Commonwealth and State environmental legislation and has developed an understanding of the permitting requirements associated with a range of industries. He has also undertaken numerous environmental assessments primarily ecological and fauna related but also for soils, surface water and sediment and groundwater.

Lincoln Smith

Principal Ecologist

Lincoln is a Commonwealth Government approved Terrestrial Ecologist. He has significant experience with site environmental management including the coordination of vegetation clearing, fauna spotting and weed mapping and management. He has undertaken numerous ecology surveys for land development, mining and infrastructure projects across Queensland and northern NSW. Recently, Lincoln has provided ecology services for the Carmichael Rail Project including the coordination of vegetation clearing and access track construction of the detailed geotechnical investigation program. This included supervising access construction across waterways and areas of challenging terrain to ensure compliance with approval conditions, applicable exemptions and general environmental duty. Lincoln also fulfilled a site Environmental Advisor / Ecologist role for Santos on the GLNG Project.

Andrew Craig

Senior Ecologist

Andrew is a Senior Ecologist with over 20 years practical experience in the areas of flora and fauna surveys throughout Queensland and the Northern Territory. Andrew's main area of expertise is the identification and classification of flora and fauna and the management of threatened species and communities as listed under the *Environment Protection and Biodiversity Conservation Act 1999*, *Nature Conservation Act 1992* and *Vegetation Management Act 1999.*

Andrew has significant experience in some of Queensland's largest infrastructure projects including coordinating geotechnical surveys for rail and gas projects, on-ground flora assessments and development of weed and vegetation management and rehabilitation strategies.

BASE/

Appendix B

Impact Area Ecology Report

TERRESTRIAL ECOLOGY ASSESSMENT REPORT FOR THE ISAAC PLAINS EAST PROJECT

Prepared for Hansen Bailey
on behalf of Stanmore Coal Pty Ltd

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October 2016

Disclaimer

The preparation of this report has been in accordance with the brief provided by the Client and relies upon data collected under limitations, as specified within the report. Specifically, Hansen Bailey provided relevant descriptions of the project and mitigation proposed. All findings, conclusions or recommendations contained within the report are based on the aforementioned circumstances and represent the professional opinions of Ecological Survey & Management. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Ecological Survey & Management.

Ecological Survey & Management would like to thank Samantha Davis, Environment and Community Superintendent of Stanmore IP Coal Pty Ltd, for her assistance with the field surveys.

Document History and Status

Document:	15046 Rpt01d
Author(s):	Meredith Watherston
Reviewed by:	Steve Marston/Chris Hansen
Approved by:	Steve Marston
Signed :	
Date issued:	14 October 2016

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Symbols and Abbreviations

*	(Preceding a plant species name) plant species not native to Australia
±	With or without, more or less
BAMM	Biodiversity Assessment and Mapping Methodology
BoM	Bureau of Meteorology
BPA	Biodiversity Planning Assessment
CHPP	Coal Handling and Preparation Plant
DAF	(Queensland) Department of Agriculture and Fisheries
DotE	(Commonwealth) Department of the Environment
DSITI	(Queensland) Department of Science, Information Technology and Innovation
DSITIA	Former (Queensland) Department of Science, Information Technology and the Arts
EA	Environmental Authority
EAR	Environmental Assessment Report
EDL	Ecologically Dominant Layer
EHP	(Queensland) Department of Environment and Heritage Protection
EIS	Environmental Impact Statement
EO Act	(Queensland) *Environmental Offsets Act 2014*
EP Act	(Queensland) *Environmental Protection Act 1994*
EPBC Act	(Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
GDE	Groundwater dependent ecosystem
GES	General ecological significance
GPS	Global positioning system
ha	Hectares
HES	High ecological significance
km	Kilometres
ML	Mining lease
MLES	Matters of local environmental significance (EO Act)
MNES	Matters of national environmental significance (EPBC Act)
MSES	Matters of state environmental significance (EO Act)

Mtpa	Million Tonnes per annum
NC Act	(Queensland) *Nature Conservation Act 1992*
NC Regulation	(Queensland) Nature Conservation (Wildlife) Regulation 2006
NC WM Regulation	(Queensland) Nature Conservation (Wildlife Management) Regulation 2006
NRM	(Queensland) Department of Natural Resources and Mines
QEOP	Queensland Environmental Offsets Policy 2014
RE	Regional Ecosystem as defined under the Queensland Vegetation Management Regulation 2000
REDD	Regional Ecosystem Description Database
ROM	Run of mine
SPRAT	Species Profile and Threats Database
SRI Guideline	Queensland Environmental Offsets Policy Significant Residual Impact Guideline
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
VM Act	(Queensland) *Vegetation Management Act 1999*
WoNS	Weeds of National Significance
WPA	Wetland protection areas

Glossary

Term	Definition
Biodiversity Status	This is an EHP classification dependent on condition of remnant vegetation *in addition* to the criteria used to determine class under the Queensland *Vegetation Management Act 1999*. This classification is used for a range of planning and management applications, i.e. to determine environmentally sensitive areas. A regional ecosystem is listed as 'endangered' if: ▪ Less than 10 % of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss; or ▪ 10-30 % of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss and the remnant vegetation is less than 10,000 ha; or ▪ It is a rare regional ecosystem subject to a threatening process. A regional ecosystem is listed as 'of concern' if: ▪ 10-30 % of its pre-clearing extent remains unaffected by moderate degradation and/or biodiversity loss. A regional ecosystem is listed as 'no concern at present' if: ▪ The degradation criteria listed above for 'endangered' or 'of concern' regional ecosystems is not met.
Benchmark condition	Benchmark condition describes the standard or typical condition of a particular RE in an undisturbed condition and is determined from an average value from mature and long undisturbed reference of 'Best on Offer' sites (Eyre et al. 2011). Benchmarks are developed by the EHP for various vegetation communities, but not all at this stage.
Bioregion	A geographically distinct biological region, which is a reporting unit for assessing the status of native ecosystems and their level of protection. Australia is divided into 89 bioregions. Bioregions form part of the regional ecosystem classification code system. The ecology study area is located in the Northern Bowen Basin sub-region of the Brigalow Belt Bioregion.
Ecology study area	An area defined for the purposes of this baseline study and impact assessment, which comprises the project site (the proposed mining lease boundary for the project) and the proposed haul road connections (shown on Figure 2).
Endangered	Prescribed to a threatened ecological community, regional ecosystem or species under the Queensland *Vegetation Management Act 1999*, *Nature Conservation Act 1992* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Environmentally Sensitive Area (ESA)	Defined under the Environmental Protection Regulation 2008, a Category A Environmentally Sensitive Area is: ▪ a national park, conservation park or forest reserve under the *Nature Conservation Act 1992* ▪ the wet tropics area under the *Wet Tropics World Heritage Protection and Management Act 1992*

Term	Definition
	▪ the Great Barrier Reef Region under the *Great Barrier Reef Marine Park Act 1975* ▪ a marine park under the *Marine Parks Act 2004*. A Category B Environmentally Sensitive Area is: ▪ a coordinated conservation area, a wilderness area, a World Heritage management area, an international agreement area, an area of critical habitat or major interest identified under a conservation plan or an area subject to an interim conservation order under the *Nature Conservation Act 1992* ▪ an area subject to the Bonn, Ramsar or Paris Conventions ▪ a zone of a marine park under the *Marine Parks Act 2004* ▪ an area to the seaward side of the highest astronomical tide ▪ a place of cultural heritage significance or a registered place under the *Queensland Heritage Act 1992* ▪ an area recorded in the Aboriginal Cultural Heritage Register under the *Aboriginal Cultural Heritage Act 2003* ▪ a feature protection areas, State forest park or scientific area under the *Forestry Act 1959* ▪ a declared fish habitat or place of a marine plant area under the *Fisheries Act 1994* ▪ an endangered regional ecosystem identified in the database known as the 'Regional ecosystem description database'.
EPBC Act conservation status	The *Environment Protection and Biodiversity Conservation Act 1999* lists species and communities: Extinct in the wild: ▪ It is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or ▪ It has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a timeframe appropriate to its life cycle and form. Critically Endangered: ▪ It is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria. Endangered: ▪ It is not critically endangered; and it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria. Vulnerable: ▪ It is not critically endangered or endangered; and ▪ It is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria. Migratory: ▪ Migratory species which are native to Australia and are included in the appendices to the Bonn Convention

Term	Definition
	(Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II); ▪ Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the Chine-Australia Migratory Bird Agreement (CAMBA); ▪ Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).
Least Concern	Prescribed to regional ecosystems listed under the Queensland *Vegetation Management Act 1999*.
MNES	A matter protected under the EPBC Act, including: ▪ World heritage properties ▪ National heritage places ▪ Wetlands of international importance ▪ Listed threatened species and ecological communities ▪ Migratory species ▪ Commonwealth marine areas ▪ The Great Barrier Reef Marine Park ▪ Nuclear actions ▪ A water resource, in relation to coal seam gas development and large coal mining development.
MSES	A matter of State environmental significance listed in Schedule 2 of the Queensland Environmental Offsets Regulation 2014 including: ▪ Regulated vegetation ▪ Connectivity areas ▪ Wetlands and watercourses ▪ High preservation areas of wild river areas ▪ Protected wildlife habitat ▪ Protected areas ▪ Highly protected zones of State marine parks ▪ Fish habitat areas ▪ Waterways providing for fish passage ▪ Marine plants ▪ Legally secured offset areas.

Term	Definition
MLES	A matter described in Section 5(3) of the Queensland Environmental Offset Regulation 2014 as a matter of local environmental significance for which an environmental offset is required under a local planning instrument.
NC Act conservation status	Under the *Nature Conservation Act 1992*, native wildlife may be prescribed as: Extinct in the wild: ▪ There have been thorough searches conducted for the wildlife; and ▪ The wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife. Endangered: ▪ There have not been thorough searches conducted for the wildlife and the wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife; or ▪ The habitat or distribution of the wildlife has been reduced to an extent that the wildlife may be in danger of extinction; or ▪ The population size of the wildlife has declined, or is likely to decline, to an extent that the wildlife may be in danger of extinction; or ▪ The survival of the wildlife in the wild is unlikely if a threatening process continues. Vulnerable: ▪ The population size or distribution of the wildlife has declined, or is likely to decline, to an extent that the wildlife may become endangered because of a threatened process; or ▪ The population size of the wildlife has been seriously depleted and the protection of the wildlife is not secured; or ▪ The population of the wildlife is low or localised and dependent on habitat that has been, or is likely to be, adversely affected, in terms of quantity or quality, by a threatening process. Near Threatened: ▪ The population size or distribution of the wildlife is small and may become smaller; or ▪ The population size of the wildlife has declined, or is likely to decline, at a rate higher than the usual rate for population changes for the wildlife; or ▪ The survival of the wildlife in the wild is affected to an extent that the wildlife is in danger of becoming vulnerable. Least Concern: ▪ The Wildlife is common or abundant and is likely to survive in the wild.
Near Threatened	Prescribed to species listed under the Queensland *Nature Conservation Act 1992*.

Term	Definition
Of Concern	Prescribed to regional ecosystems listed under the Queensland *Vegetation Management Act 1999*.
Project site	The proposed mining lease boundary for the project (shown on Figure 2).
Region	The local area surrounding the project site, including the landscape within 25 km of the project site.
Regional ecosystem	A vegetation community within a bioregion that is consistently associated with a particular combination of geology, landform and soils.
Regulated vegetation	Vegetation regulated through the *Sustainable Planning Act 2009*
Remnant vegetation	Defined under the Queensland *Vegetation Management Act 1999* as, woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has >70% of the height and >50 % of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.
Significant species and vegetation	Refers to: ▪ Species listed as Endangered, Vulnerable or Near Threatened under the Queensland Nature Conservation (Wildlife) Regulation 2006 or Critically Endangered, Endangered or Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* ▪ Threatened ecological community listed as Critically Endangered, Endangered or Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* ▪ Regional ecosystems with an Endangered or Of Concern biodiversity status or *Vegetation Management Act 1999* status.
Special least concern	Defined under the Queensland Nature Conservation (Wildlife) Regulation 2006 as: a) the echidna (*Tachyglossus aculeatus*) b) the platypus (*Ornithorhynchus anatinus*) c) a least concern bird to which any of the following apply – i. Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA) ii. Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA) iii. Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).
Threatened ecological community	A community listed under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Term	Definition
Vegetation management Act status	This is a statutory classification under the Queensland *Vegetation Management Act 1999*. A regional ecosystem is listed as 'endangered' if: ▪ Remnant vegetation for the regional ecosystem is less than 10% of its pre-clearing extent across the bioregion; or 10-30% of its pre-clearing extent remains and the remnant vegetation for the regional ecosystem is less than 10,000 ha. A regional ecosystem is listed as 'of concern' if: ▪ Remnant vegetation for the regional ecosystem is 10-30% of its pre-clearing extent across the bioregion; or more than 30% of its pre-clearing extent remains and the remnant vegetation extent for the regional ecosystem is less than 10,000 ha. A regional ecosystem is listed 'least concern' if: ▪ Remnant vegetation for the regional ecosystem is over 30% of its pre-clearing extent across the bioregion, and the remnant vegetation area for the regional ecosystem is greater than 10,000 ha.
Vulnerable	Prescribed to a threatened ecological community or species under the Queensland *Nature Conservation Act 1992* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

1 Introduction

1.1 Overview

Ecological Survey & Management was commissioned by Hansen Bailey, on behalf of Stanmore IP Coal Pty Ltd (the proponent), to complete a terrestrial ecology assessment which forms part of the Environmental Assessment Report (EAR) for the Isaac Plains East Project (the project). The EAR is being used in support of an application to amend the Isaac Plains Mine Environmental Authority (EA). Relevant information from the EAR will also be used in support of a referral for the project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Isaac Plains Mine is an operating open cut coal mine located approximately 5 km north-east of Moranbah township in Central Queensland (Figure 1). The Isaac Plains Mine commenced operation in 2006 and produces export coking coal. The mine has approval to produce up to 4 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal which equates to approximately 2.8 Mtpa of product coal.

The Isaac Plains Mine was acquired by the proponent in late 2015 and recommenced open cut mining operations in early 2016 after a period of approximately 12 months on care and maintenance. The open cut mining operations at the Isaac Plains Mine are currently scheduled to cease in late 2018. Current mining operations include removal of overburden by dragline with truck and shovel pre-stripping. ROM coal is hauled by truck from the open cut pits to an on-site Coal Handling and Preparation Plant (CHPP) for washing and processing. Product coal is loaded to trains for transport from site via an on-site rail loop and train loading facility.

The project involves the development of open cut pits in an adjoining area to the east of the existing Isaac Plains mining lease (Figure 2). A new mining lease will be required for this area. The project will be operated as an extension of the Isaac Plains Mine and will utilise the existing Isaac Plains Mine infrastructure, mining equipment and workforce. It will extend the life of the Isaac Plains Mine by approximately 7 years.

The project open cut mining operations will be similar to operations at the existing Isaac Plains Mine. New infrastructure for the project will be limited to:

- haul roads and access roads, including connections to the existing Isaac Plains Mine road network
- ROM coal stockpile areas at the top of the open cut pit ramps, including vehicle parking areas and mobile crib huts
- minor laydown areas and a substation
- stormwater drains, pit water pipelines and sediment control works.

1.2 Study objectives

This report assesses the potential ecological impacts of the project and specifically:

- describes the regulatory requirements relevant to the project
- summarises the results of seasonal terrestrial flora and fauna surveys, which were designed based on the flora and fauna survey methodologies of the Commonwealth Department of the Environment (DotE) and the Queensland Department of Environment and Heritage Protection (EHP)
- provides a comprehensive flora and fauna inventory of the project site
- provides regional ecosystem (RE) mapping developed in accordance with the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 3.2 (Neldner et al. 2012)
- assesses the presence of any groundwater dependent ecosystems (GDEs)
- assesses the likelihood of occurrence, and identifies and maps habitat for, matters of national and state environmental significance (MNES and MSES), including species and communities protected under the Commonwealth EPBC Act, Queensland *Vegetation Management Act 1999* (VM Act) and Queensland *Nature Conservation Act 1992* (NC Act)
- assesses the potential impacts of the project on MNES and MSES ecological matters
- provides mitigation and management strategies to reduce impacts on flora and fauna
- confirms the requirements for any offsets under the EPBC Act and / or under the Queensland *Environmental Offsets Act 2014* (EO Act).

1.3 Regional context

The project site is located within the Bowen Basin in central Queensland within the Isaac River drainage sub-basin of the Fitzroy Drainage Basin. The region experiences sub-tropical conditions with average temperatures ranges recorded in Moranbah of between 21.1^{o}C and 34.0^{o}C in the summer months, and 9.9^{o}C and 23.7^{o}C in the winter months (BoM 2016). The region receives an annual average rainfall of approximately 614.2 mm with a pronounced wet season. Approximately 70% of the annual rainfall is typically recorded between November and March (BoM 2016).

The predominant land use within the project site is cattle grazing. No World Heritage Areas or other conservation areas are located in the region.

1.4 Description of the ecology study area

The project ecology study area (study area) encompasses the proposed mining lease boundary for the project, and associated haul road connections to the

existing Isaac Plains Mine road network (Figure 2). The study area covers an area of approximately 1,269 ha.

The study area contains scattered patches of remnant vegetation comprising woodland to open forest communities interspersed with areas cleared for cattle grazing.

The topography within the study area is relatively flat with a low rise in the central portion of the site. Two drainage systems, Smoky Creek and Billy's Gully, traverse the study area from east to west, in the north and south of the study area, respectively. These watercourses enter the Isaac River approximately 10 km south-west of the study area. The Goonyella Railway line adjoins the study area's northern boundary, and the Peak Downs Highway adjoins the study area's southern boundary.

Cattle grazing is the dominant land use within the study area.

2 Regulatory framework

2.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Commonwealth Government's principal piece of environmental legislation, and is administered by the DotE. It is designed to protect national environmental assets, known as 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.

Approval is required under the EPBC Act for any action (which includes a development, project or activity) that is likely to have a significant impact on MNES (including nationally threatened ecological communities and species, and listed migratory species).

An EPBC Act referral was lodged for the Isaac Plains Mine in May 2005 (EPBC 2005/2070). The Isaac Plains Mine was found to be "not a controlled action", meaning that approval under the EPBC Act is not required for the mine. A separate referral under the EPBC Act will be made for the project.

2.2 Queensland Vegetation Management Act 1999

The 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* (SP Act), 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. Permits under either the VM Act or SP Act for vegetation clearing are not required for the project, given it is located within a ML, and therefore vegetation clearing for the project will be regulated by the EA issued under the *Environmental Protection Act 1994*.

The VM Act 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
- 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 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 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 EO Act to offset impacts to least concern, near threatened or 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 occurrence in the study area have been assessed and considered within this report.

The NC Act and associated regulations require that the following approvals be obtained, where relevant to 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.

- 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 Biosecurity Act 2014

The Queensland *Biosecurity Act 2014* (Biosecurity Act) provides a framework for the control and management of pests, weeds, diseases, and contaminants, along with creating an overarching general biosecurity obligation for the State. The key principle of the Act is shared responsibility for the mitigation of biosecurity risks.

The Biosecurity Act lists biosecurity matters as either prohibited or restricted. Prohibited matters are biosecurity matters that are not yet found in Queensland. Restricted matters are biosecurity matters found in Queensland that require restrictions to reduce, control or contain the matter. The Act details seven categories of restricted matters, based on the level on mitigation required. The seven categories of restricted matters are:

- Category 1 and 2 must be reported to the Department of Agriculture and Fisheries (DAF) within 24 hours of becoming aware of their presence
- Category 3 must not be distributed or released into the environment
- Category 4 must not be moved or spread into other areas of the State
- Category 5 are those that have a high risk of negatively impacting the environment, and must not be kept
- Category 6 must not be kept or fed
- Category 7 must be killed and disposed of if caught or found.

Some restricted matters fall into multiple categories, and therefore require several different management measures for their control.

Further to prohibited or restricted matters declared under the Act, the Biosecurity Act also recognises other invasive species (such as Cane Toads) as species which fall under a general biosecurity obligation (GBO). A GBO means that, while there is no legal requirement for control of these pests, reasonable and practical steps must be undertaken to minimise their spread.

The Biosecurity Act is administered by DAF.

2.5 Queensland Environmental Protection Act 1994

The 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 EA prior to operation
- requirement for an environmental impact assessment process in support of an EA application.

2.6 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 EHP to generate Biodiversity Planning Assessments (BPAs) for each of Queensland's bioregions, including the Brigalow Belt Bioregion where the project is located.

BPAs are developed in two stages:

1) diagnostic criteria: involves the integration of ecological criteria using BAMM to determine the relative Biodiversity Significance
2) supplementary/expert panel criteria: allows 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.

2.7 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)
- 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 2016a).

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
- 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 2016a).

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 2016a).

In addition to these bilateral 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 2016).

2.8 Government mapping

2.8.1 Map of Referable Wetlands

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
  - 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.

2.8.2 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).

2.8.3 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 the 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.

Significant residual impacts on REs located within a defined distance of watercourses are required to be offset.

2.8.4 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.

2.8.5 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.

2.8.6 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.

2.9 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.

2.10 Queensland Environmental Offsets Policy

The *Queensland Environmental Offsets Policy (Version 1.2)* (QEOP) (EHP 2016a) came into force in June 2016. The EO Act, *Environmental Offsets Regulation 2014* (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). However, as stated in the EO Act, an offset for a prescribed environmental matter which has been assessed under the EPBC Act is not subject to offset conditions under the EO Act.

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
  - 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

- legally secured offset areas.

The MSES relevant to the project are discussed in Section 9.3.

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

3 Methodology

3.1 Nomenclature and taxonomy

3.1.1 Flora

Application of flora scientific names in this report follows Bostock and Holland (2010). In the first occurrence in the text, common names (if one exists) will be followed by its scientific name. Common names for flora were derived from Harden et al. (2006), Brooker and Kleinig (2008), Maslin (2001), Hacker (1990), Tothill and Hacker (1996) , Sharp and Simon (2002), and Auld and Medd (2002). Use of an asterisk (*) indicates the species is not native to Queensland, e.g. Common Lantana (**Lantana camara* var. *camara*). Following the first in-text reference, species will be referred to by common name only, where one exists.

3.1.2 Fauna

Taxonomy and nomenclature for fauna species within this report follows the following references:

- amphibians – Tyler and Knight (2011)
- reptiles – Wilson and Swann (2013)
- birds – Pizzey et al. (2012)
- mammals (except bats) – Menkhorst and Knight (2011)
- bats – Churchill (2009).

Common names are used where a species has an accepted common name with the scientific name provided at the first instance of the name appearing in the text. Common names for fauna are sourced from the references listed above or where no common name is provided, searches are made for other widely accepted common names.

3.2 Desktop study

3.2.1 Database searches and government mapping

Commonwealth and state database searches were undertaken for the study area to identify records or potential occurrences of threatened, near threatened, migratory and/or special least concern flora and fauna species and TECs. Database searches were undertaken within a 25 km radius of the boundary of the project site. The search radius is considered to be representative of the broader region.

Desktop searches covered the following databases and government mapping sources:

- EPBC Act Protected Matters Search Tool, accessed 6 July 2016 (DotE 2016b) (Appendix A)
- Queensland Wildlife Online database, accessed 6 July 2016 (DSITI 2016) (Appendix B)

- Queensland Herbarium HERBRECS database, accessed 10 September 2015 (Queensland Herbarium 2015a) (Appendix C)
- Queensland Museum Zoology Database, accessed 3 September 2015 (Queensland Museum 2015) (Appendix D)
- The Atlas of Australian Birds, accessed 2 September 2015 (BirdLife Australia 2015a) (Appendix E)
- The Atlas of Living Australia[1], accessed 6 July 2016 (CSIRO 2016a)
- Regulated Vegetation Management Map, Vegetation Management Supporting Map Version 8.0, Remnant 2013 regional ecosystem mapping Version 9.0 and Essential Habitat Mapping and Database Version 4.0, maps at 1:100 000 scale (NRM 2016a)
- Protected Plants Flora Survey Trigger Map, accessed 6 July 2016 (EHP 2016b) (Appendix F)
- Biodiversity Planning Assessments – Brigalow Belt Version 1.3 (EPA 2008)
- Geological Survey of Queensland 1:100 000 mapping (NRM 2011)
- Map of referrable wetlands, accessed 7 July 2016 (EHP 2016c)
- Atlas of Groundwater Dependent Ecosystems, accessed 7 July 2016 (National Water Commission 2016)
- Queensland Wetland Data Springs Mapping (NRM 2016b)
- Environmentally Sensitive Area mapping, accessed 7 July 2016 (EHP 2016d).

3.2.2 Literature review and previous studies

Available literature was reviewed to establish whether findings of recent and nearby studies are relevant to the vegetation and habitat that occurs in the study area. Studies within, adjacent to or in the region, i.e. <25 km of the project site were reviewed where available, including:

- Integrated Isaac Plains Project Environmental Impact Statement, Flora and Fauna Assessment (Ecotone Environmental Services 2005).
- Millennium Mine Expansion Project Environmental Impact Statement (Peabody Energy 2010)
- Grosvenor Project Amended Flora and Fauna Assessment (Ecotone Environmental Services and Hansen Bailey 2011)
- Terrestrial Flora and Fauna Report for Moranbah South Project (Ecological Survey & Management 2013)
- Red Hill Mining Lease Flora Survey Report (URS 2013a)
- Red Hill Mining Lease Terrestrial Fauna Technical Report (URS 2013b)

[1] The Atlas of Living Australia is a publically available database that is populated by a wide range of contributors including 'citizen-based' contributors. The database does not allow for every individual observation to be validated, therefore, this database has been used as secondary supporting information.

- Caval Ridge Coal Mine Project Environmental Impact Statement (BAAM 2009)
- Daunia Coal Mine Project Environmental Impact Statement (SKM 2009)
- Eagle Downs Project Flora and Fauna Impact Assessment (Hansen Bailey 2009).

The location of these mines and projects is shown Figure 3.

3.2.3 Review of aerial photography

The most recent aerial photography (flown September 2015) was provided by the proponent for this assessment. Digital Globe photography was viewed in relation to relevant biodiversity spatial layers. Aerial photography was used to identify features for ground-truthing during the field surveys, to identify appropriate survey locations and for determining and characterising potential terrestrial flora and fauna habitats.

3.2.4 Regional ecosystem mapping

The Queensland Government produces regulated vegetation maps and supporting 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. Review of version 8.0 (statutory regulated vegetation mapping) RE maps was undertaken prior to field surveys to assist in the verification of RE types mapped in the study area. The Queensland Herbarium has also produced informal, non-statutory RE mapping, *Remnant 2013 – regional ecosystem mapping - Version 9.0.* This mapping was also reviewed prior to field surveys to inform survey locations.

3.2.5 Geological mapping

A review of geological mapping of the study area has been undertaken and is provided in Section 4.1.1. The geological mapping was reviewed in order to gain an understanding of the geology within the study area and to provide an indication of likely land zones for assigning REs.

3.2.6 Soil mapping

A review of the soil mapping for the study area has been undertaken and is provided in Section 4.1.2. The soil mapping was reviewed in order 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.

3.3 Terrestrial ecology field surveys

3.3.1 Survey team

Five ecologists undertook the field surveys and preparation of this terrestrial ecology assessment. The team and their qualifications are outlined in Appendix G. Site environmental personnel from the Isaac Plains Mine assisted with the field survey.

3.3.2 Permits

Surveys were undertaken under the following permits and approvals:

- Scientific Purposes Permit: WISP151475414 (valid from 25 October 2014 to 24 October 2019)
- Animal Ethics Committee Approval: CA2015/09/898 (valid from 1 October 2015 to 25 August 2018).

3.3.3 Coordinate system and map datum

Positional data was collected using a geographic positioning system with an accuracy of 3 to 5 m. Positional locations were recorded using the Latitude and Longitude coordinate system. All locations presented in this report are within zone 55K. The map datum used was WGS84.

3.3.4 Survey timing

Dry and wet season terrestrial flora and fauna surveys were conducted in order to field-validate the type, distribution and remnant status of vegetation communities and develop an inventory of flora and fauna species present. The following surveys were conducted:

- flora surveys:
  - dry season = 4 days (22 - 24 September 2015 and 20 October 2015, inclusive)
  - wet season = 5 days (24 February – 28 February 2016, inclusive)
- fauna surveys:
  - dry season = 8 days (14 - 21 October 2015, inclusive)
  - wet season = 7 days (4 – 10 March 2016, inclusive).

Field surveys were completed at these times in order to capture the effects of seasonality and rainfall on the abundance of flora and fauna species. The timing of the field surveys is in accordance with the fauna survey standards specified in Appendix H.

3.3.5 Climatic conditions

Climatic data has been collected since 1972 from the (now decommissioned) Bureau of Meteorology (BoM) weather station at the Moranbah Water Treatment Plant (WTP) (Station No.: 034038), which is the closest long-term BoM meteorological station to the study area. This weather station was closed in 2012, and was relocated to the Moranbah Airport (Station No.: 034035).

Rainfall patterns

Monthly rainfall averages recorded at the BoM Moranbah WTP weather station are provided in Table 1. Given the rainfall records at this station cover a period of 40 years, the data are considered to reflect regional rainfall patterns.

Actual monthly rainfall totals recorded in 2014 to 2016 at the BoM Moranbah Airport weather station are also provided in Table 1. These data were used to

show average regional rainfall information at the time of the surveys and in the preceding year.

As can be seen from Table 1, below average rainfall was received in the eight months (i.e. between February and September 2015) leading up to the dry season surveys in September and October 2015. Above average falls were received in the region in November 2015. Below average rainfall was again received in December 2015 and January 2016. In contrast, the region experienced a significant rainfall event in early February 2016 preceding the wet season surveys.

Table 1: Monthly recorded rainfall for the local area

Month	Moranbah WTP Weather Station (034038) Mean Rainfall (mm)	Moranbah Airport Weather Station (034035)		
		Actual Total Rainfall 2014 (mm)	Actual Total Rainfall 2015 (mm)	Actual Total Rainfall 2016 (mm)
January	103.8	57.0	206.6	52.6
February	100.7	128.6	77.6	260.6
March	55.4	65.0	4.0	53.6
April	36.4	24.8	1.2	0.0
May	34.5	2.8	2.0	5.0
June	22.1	10.4	2.2	85.0
July	18.0	0.8	3.2	123.6
August	25.0	37.8	5.6	-
September	9.1	44.2	0.0	-
October	35.7	2.0	1.8	-
November	69.3	33.4	101.8	-
December	103.9	141.8	53.0	-

Source: (BoM 2016)

Weather conditions during the surveys

Daily weather conditions recorded at the BoM's weather station at Moranbah Airport for the week preceding, as well as during the period of the ecology surveys, are presented in Table 2.

Daytime weather conditions experienced during the dry season fauna survey period were warm with maximum daily temperatures between 31.4°C and 34.0°C. Evenings were cooler, with minimum temperatures ranging from 13.6 to 17.3°C. These temperatures are generally conducive to the detection of most animal groups.

Milder daytime temperatures were experienced during the wet season fauna survey, with maximum temperatures between 26.2°C and 32.5°C. Night time temperatures during the wet season fauna survey were still warm, with the minimum being 21.0°C. The warm overnight temperatures during the wet season survey, coupled with the rainfall in early February, made conditions favourable for the detection of all animal groups.

No rainfall was recorded at Moranbah during, or for the two weeks preceding, the dry season survey period, and consequently conditions were not favourable

for the detection of amphibians and wetland birds. As a result, a low species richness and absence of annual forbs and grasses in the groundcover layer, of the vegetation types throughout the project site was observed at the time of the dry season surveys. The residual groundcover vegetation was mostly 'hayed-off' and generally lacking fertile material (i.e. inflorescence).

More favourable conditions were experienced during the wet season survey, which allowed a more complete inventory of flora in the project site and assessment of ecological condition, particularly of the groundcover vegetation. In excess of 300 mm was recorded at the BoM Moranbah Airport weather station between 25 January and 8 February prior to the wet season field survey, with 169 mm recorded on 6 February (BoM 2016). The hot conditions and substantial rainfall experienced in the region in the month prior to the flora survey created optimal conditions for the detection and identification of flora species, including cryptic species.

Table 2: Daily weather conditions recorded at the BoM Moranbah Airport Weather Station (034035) preceding and during the ecology surveys

Date	Temp Min (ºC)	Temp Max (ºC)	Rainfall (mm)
Dry Season Surveys			
6 September 2015	10.2	28.6	0
7 September 2015	13.2	29.0	0
8 September 2015	10.1	30.9	0
9 September 2015	17.1	28.1	0
10 September 2015	12.3	27.7	0
11 September 2015	11.9	28.4	0
12 September 2015	12.8	28.5	0
13 September 2015	10.9	28.8	0
14 September 2015	12.7	25.8	0
15 September 2015	12.1	30.6	0
16 September 2015	15.2	31.5	0
17 September 2015	11.2	33.5	0
18 September 2015	17.5	28.5	0
19 September 2015	9.9	28.5	0
20 September 2015	12.5	30.1	0
21 September 2015	13.2	30.7	0
22 September 2015^	13.8	31.8	0
23 September 2015^	13.0	30.3	0
24 September 2015^	9.7	27.1	0
25 September 2015	11.0	27.6	0
26 September 2015	10.6	28.7	0
27 September 2015	10.7	30.1	0
28 September 2015	11.0	31.0	0
29 September 2015	10.5	30.2	0
30 September 2015	15.2	31.7	0
1 October 2015	12.7	32.8	0

Date	Temp Min (°C)	Temp Max (°C)	Rainfall (mm)
2 October 2015	13.6	32.5	0
3 October 2015	14.8	30.4	0
4 October 2015	13.0	30.1	0
5 October 2015	14.4	32.9	0
6 October 2015	12.7	32.9	0
7 October 2015	13.9	32.3	0
8 October 2015	14.3	30.3	0
9 October 2015	16.4	29.8	0
10 October 2015	14.5	29.7	0
11 October 2015	15.5	30.1	0
12 October 2015	13.6	31.7	0
13 October 2015	11.2	33.2	0
14 October 2015*	14.2	32.4	0
15 October 2015*	16.1	31.4	0
16 October 2015*	14.7	32.0	0
17 October 2015*	14.7	31.4	0
18 October 2015*	13.6	32.2	0
19 October 2015*	17.3	31.5	0
20 October 2015*^	14.9	31.7	0
21 October 2015*	15.2	34.0	0
Wet Season Survey			
10 February 2016	20.0	31.3	0
11 February 2016	21.3	32.1	0
12 February 2016	19.8	33.0	0
13 February 2016	29.0	33.1	0
14 February 2016	18.0	34.7	0
15 February 2016	19.3	36.9	0
16 February 2016	18.6	38.2	0
17 February 2016	21.7	38.6	0
18 February 2016	22.1	39.7	0
19 February 2016	22.5	38.4	0
20 February 2016	21.6	36.2	0
21 February 2016	23.3	33.3	0
22 February 2016	24.7	31.8	0
23 February 2016	22.3	32.6	0
24 February 2016^	19.9	32.3	0
25 February 2016^	19.7	33.2	0
26 February 2016^	18.5	37.0	0
27 February 2016^	21.1	38.5	0
28 February 2016^	22.9	36.8	0
29 February 2016	22.1	34.2	4.6
1 March 2016	21.8	32.9	0
2 March 2016	23.3	34.2	0

Date	Temp Min (°C)	Temp Max (°C)	Rainfall (mm)
3 March 2016	22.8	32.5	2.0
4 March 2016*	22.3	30.0	0
5 March 2016*	21.4	28.6	7.2
6 March 2016*	22.1	26.2	0.4
7 March 2016*	21.7	29.5	4.6
8 March 2016*	21.9	29.3	2.0
9 March 2016*	21.3	30.0	0.2
10 March 2016*	21.0	32.5	2.8

Source: (BoM 2016)
Survey Dates indicated in grey highlight: * indicates fauna survey dates, ^ indicates flora survey dates.

3.3.6 Flora field survey methods

The flora field survey methods described in this section were developed based on the results of database searches for the study area, as presented in Section 4.3.

Site selection

The field flora survey methods were developed in order to:

- validate existing Queensland government RE vegetation mapping, and better define the distribution and proportionate composition of REs within mixed polygons of more than one RE type
- target significant flora species and communities (listed under Commonwealth and State legislation) and their habitats identified from database searches
- produce a comprehensive floral inventory for all vegetation assessment sites and the project site as a whole.

The field flora surveys were carried out in compliance with the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 3.2 (Neldner et al. 2012). Assessment sites were performed throughout the entire project site so as to thoroughly assess Queensland government mapped remnant vegetation.

The validation and mapping of remnant vegetation was undertaken at a total of 95 vegetation assessment sites and 36 photo monitoring points during the dry season and wet season flora surveys (Figure 4). Multiple sites were conducted within each RE type across the study area.

Of the 95 vegetation assessment sites, 24 were detailed secondary sites, 35 tertiary sites and 36 modified quaternary sites (Figure 4). The less detailed sampling (tertiary and quaternary assessment sites) was conducted to provide additional information relating to the vegetative structure and composition and to assist in mapping the extent and distribution of the identified REs within the study area.

Detailed flora species lists were collated at all secondary sites (Figure 4) and traverse lists were compiled to account for additional species that were recorded outside of the secondary site plots.

Additional data pertaining to groundcover characteristics (e.g. cover, species composition) and the cover of woody vegetation was used in conjunction with floral inventories from selected secondary sites to assess several areas of vegetation communities against the condition thresholds of relevant Commonwealth listed TECs returned in database searches (discussed further, later in this section).

Secondary sites

Data at each secondary site was collected in accordance with the Queensland Herbarium's secondary site assessment methodology (Neldner et al. 2012). Data recorded at each secondary site (Figure 4) included:

- date and precise location (with reference to handheld GPS)
- soils, slope, aspect and landform observations
- ground-layer, mid-stratum and canopy species composition and abundance
- structural characteristics
- condition and disturbance of existing vegetation communities (including distribution of weed species)
- quantitative and qualitative species composition within a 1,000 m^2 quadrat, and documentation of ancillary species identified within the immediate area or during foot traverse
- basal area of vegetation (Bitterlich Stick methodology)
- photographs of the community (north, east, south, west, groundcover and soils).

Tertiary sites

Data recorded at each tertiary site (Figure 4) included:

- date and precise location (with reference to handheld GPS)
- soils, slope, aspect and landform observations
- ground-layer, mid-stratum and canopy species composition and abundance
- structural characteristics
- basal area of vegetation (Bitterlich Stick methodology)
- condition and disturbance of existing vegetation communities (including distribution of weed species)
- photographs of the community.

Quaternary sites

Data recorded at each quaternary site (Figure 4) included:

- precise location (with reference to handheld GPS)
- ground-cover, mid-stratum and canopy species composition and abundance
- structural characteristics of the ecologically dominant layer (EDL)
- condition
- limited photographs of the community.

Threatened ecological community surveys

Detailed transects were undertaken in the study area to assess the structure and ecological condition of vegetation communities that could potentially represent TECs. The transects focussed on the Brigalow and the Natural Grassland TECs, given DotEE has specific condition thresholds and diagnostic criteria that are required to be met for a vegetation community to form a part of these TECs. (Section 4.2.1 discusses the TECs that database searches have indicated may be present within the study area).

Brigalow TEC

A patch of Brigalow low woodland in the north-eastern portion of the study area (validated in the field as non-remnant) was surveyed using detailed transects to determine if it satisfied the diagnostic criteria and condition thresholds (as provided in conservation advice, (TSSC 2013a) to form a part of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC (Brigalow TEC). Two transects were undertaken for the assessment, and the location of these transects are shown on Figure 4.

Within each transect, the cover-intercept or projected canopy cover of woody vegetation was recorded for each vegetation stratum, except the groundcover layer. The cover-intercept was determined by measuring the proportion of the 100 m long transect that was intercepted by the foliage of woody vegetation within the shrub and tree layers.

The composition of the groundcover layer was then determined by measuring the percentage of groundcover parameters within ten 1 m^2 quadrats along a 100 m long transect. The nested quadrats were measured every 10 m after starting at the 5 m mark on the 100 m transect. The groundcover parameters included: native grasses; native herbs; native shrubs less than 1 m in height; native ferns; native aquatic vegetation; cryptogams; non-native grasses; non-native herbs, shrubs and graminoids; bare ground; litter; rocks; and, timber.

Natural Grassland TEC

Non-statutory Queensland Government mapping (Queensland Herbarium, Version 9.0) indicates the possible presence of a patch of RE 11.8.11 (natural grassland) in the northern portion of the study area.

This area of the study area was surveyed using detailed transects to determine if it satisfied the diagnostic criteria and condition thresholds (as provided in conservation advice, (TSSC 2008a)) to form a part of the Natural Grasslands of the Central Queensland Highlands and Northern Fitzroy Basin TEC (Natural Grasslands TEC). Three transects were undertaken for the assessment, and the location of these transects are shown on Figure 4. These transects were used to ascertain groundcover composition and cover, number of indicator species and tussock number per hectare.

Targeted species surveys

Significant flora species listed under the EPBC Act and/or NC Act that were recorded or predicted to occur from database searches (Section 3.2.1 and 4.3) were reviewed and, where relevant, formed the focus of targeted flora species surveys. A list of these species is provided in Section 4.3.

Detailed traverses of habitat that was considered suitable for significant flora species were undertaken. Given the proximity of known records, targeted surveys focussed on the endangered *Solanum adenophorum* and were conducted in the areas of non-remnant Brigalow present within northern portions of the study area. King Bluegrass (*Dichanthium queenslandicum*) and *Dichanthium setosum* (no common name) were also targeted in non-remnant grassland communities in the northern portion of the study area.

One significant species was recorded along the eastern boundary of the study area, *Bertya pedicellata*, and quantification of this population was undertaken during the dry season survey and re-addressed during the wet season survey. The population of this species is described in Section 5.3.2.

Vegetation mapping

Queensland Government mapped REs in the study area were validated in the field using the survey data previously described, and utilised the latest geology mapping (NRM 2011). The boundaries of vegetation types were mapped in the field using a GPS and/or aerial photograph interpretation.

An area of vegetation mapping has been undertaken outside the project site within the existing Isaac Plains mining lease. This area involves two proposed haul road connections between the Isaac Plains Mine and the project site (Figure 2 and 4), which were designed during the detailed design phase of the project and after the seasonal surveys were undertaken. Mapping in this area outside the project site was undertaken through aerial photograph interpretation, observation during field surveys, and a review of photographs provided by mine site personnel.

Random traverses

In addition to secondary, tertiary and quaternary assessment sites, large portions of the study area were traversed on foot and the random meander technique applied (Cropper 1993). The purpose of random traverses was to ensure adequate site coverage and to establish a comprehensive floral species

list. This method is also essential for the detection of cryptic, pest and other significant species.

Ancillary information

Other field characteristics such as areas of weed infestation, habitat areas for significant species and regional connectivity were recorded and described. Photographic records were taken throughout the study area, capturing each community type, habitat type and the broader landscape.

Flora inventory and abundance

A comprehensive flora species list, including native and introduced species, was compiled for the project site. Relative abundance of flora species was assessed on a site-by-site basis, with detailed inventories compiled at all secondary assessment sites.

In relation to vegetation structure, abundance estimates were determined for species within each stratum of the community, with particular focus on the EDL as it is by these species that the community is defined, and from this, the RE determined (Neldner et al. 2012).

The remnant status of existing vegetation was determined by comparing the existing predominant canopy with the undisturbed predominant canopy. The Queensland Herbarium defines the predominant canopy under the VM Act, as the EDL, namely, that stratum of the vegetation that contains the most above ground biomass. The EDL can be defined in terms of growth form, height, cover density and species. In the majority of cases, the EDL is equivalent to the upper stratum (Walker and Hopkins 1990).

The crown cover definitions and associated crown separation descriptions (e.g. sparse) were also applied to the lower strata to allow a consistent description of the spatial distribution of the respective vegetation layers.

The landform description upon which the field validated vegetation communities occurred was based on simple erosional landform patterns characterised by relief and modal slope and described by Speight (1990).

The relative abundance of species was based on the Braun-Blanquet technique, (Mueller-Dombois and Ellenberg 2003 Whittaker 1975).

3.3.7 Fauna field survey methods

The fauna field survey methods described in this section were developed based on the results of database searches for the search area, as presented in Section 4.4.

Overview of survey effort

A variety of faunal survey methods were used, including systematic trap sites, spotlighting, call playback, infrared cameras, active searching, supplementary survey sites, harp traps, Anabat survey sites and observation (e.g. bird surveys and opportunistic observations).

Sites selected for each of the survey methods were determined through desktop review of aerial photography, RE mapping and database search results in order to stratify survey effort across major habitat types for species likely to occur in the study area. Major habitat types were identified through broad vegetation groups (BVGs) mapped for the study area. BVGs were developed by the Queensland Herbarium to group vegetation communities at a high level, and are included in the RE spatial dataset (NRM 2016a). Desktop review indicated that BVGs for the study area at a 1 million scale could be divided into seven major habitat types:

- BVG11a: Moist to dry open forests to woodlands dominated by Mountain Coolabah (*Eucalyptus orgadophila*)
- BVG16a: *Eucalyptus* spp. dominated open forests and woodland drainage lines and alluvial plains
- BVG17a: Poplar Box (*Eucalyptus populnea*) or Silver-leaved Ironbark (*E. melanophloia*) (or White's Ironbark (*E. whitei*)) dry woodlands to open woodlands on sandplains or depositional plains
- BVG18b: Dry eucalypt woodlands to open woodlands primarily on sandplains or depositional plains
- BVG24a: *Acacia* spp. on residuals. Species include *A. clivicola* (no common name), *A. sibirica* (no common name), Lancewood (*A. shirleyi*), Bowyakka (*A. microsperma*), Bendee-bendee (*A. catenulata*), Ringy Rosewood (*A. rhodoxylon*)
- BVG25a: Brigalow (*Acacia harpophylla*) sometimes with Belah (*Casuarina cristata*) open forests to woodlands on heavy clay soils
- BVG30b: Tussock grasslands dominated by Mitchell Grass (*Astrebla spp.*) or Bluegrass (*Dichanthium spp.*) often with *Iseilema spp.* on undulating downs or clay plains (Neldner et al. 2015).

These major habitat types were initially used to design the survey, which was then refined where necessary in the field, once an on-ground appreciation for the vegetation communities and habitat features (e.g., locations of rocky jump-ups) could be obtained.

Table 3 details the survey effort conducted during the survey periods. The following sections describe the methods used during the surveys and locations of the survey sites.

Table 3: Fauna survey effort

Survey Technique	Survey Effort			Target Fauna
	Dry Season	Wet Season	Total	
Elliot Traps	400 trap nights	400 trap nights	800 trap nights	Small mammals, some reptiles
Pitfall Traps	64 trap nights	48 trap nights	112 trap nights	Small mammals, reptiles and frogs

Survey Technique	Survey Effort			Target Fauna
	Dry Season	Wet Season	Total	
Funnel Traps	96 trap nights	128 trap nights	224 trap nights	Small mammals, reptiles (including Ornamental Snake) and frogs
Spotlighting (including by vehicle)	15.5 person hours on foot and 10.5 person hours from slow moving vehicle	9 person hours on foot and 9.5 person hours from slow moving vehicle	24.5 person hours on foot and 20 person hours from slow moving vehicle	Mammals (including Koala, Greater Glider, Short-beaked Echidna), reptiles (including Ornamental Snake), nocturnal birds
Call Playback	11 sessions	9 sessions	20 sessions	Owls and Koala
Infrared Cameras	191 trap nights	16 trap nights	207 trap nights	Medium to large mammals (including Koala, Short-beaked Echidna), and reptiles
Bird Survey	27 person hours	28 person hours	55 person hours	Birds (including Squatter Pigeon, Migratory birds
Opportunistic / Incidental Bird Survey	98 diurnal person hours and 50 nocturnal person hours	82 diurnal person hours and 40 nocturnal person hours	180 diurnal person hours and 90 nocturnal person hours	Birds (including Squatter Pigeon, Migratory birds) medium to large reptiles
Active Searching	11 person hours	11 person hours	22 person hours	All conservation significant species, including small mammals reptiles, and birds
Anabat	8 nights	8 nights	16 nights	Bats
Harp Trap	6 trap nights	8 trap nights	14 trap nights	Bats
Koala transects	11 transects (92.8 ha)	1 transect (11.4 ha)	104.2 ha (27.5% of Koala habitat)	Koalas

Systematic trap sites

A total of eight systematic trap sites (T1 – T8) were established in areas of native vegetation throughout the study area during the season terrestrial fauna surveys (Figure 5).

Each systematic trap site consisted of:

- 25 small Elliot traps
- 4 pitfall traps
- 3 sets of two funnel traps
- 1 infrared camera.

The exception was trap site T5 where rocky ground conditions meant that it was not possible to dig pitfall traps. Instead an additional four pairs of funnel traps were used. The combined surveys comprised a total of 1,168 trap nights (trap nights refers to the total number of traps that were open for a total number of nights e.g. 4 traps open for 5 nights equates to 20 trap nights).

Elliot traps were baited with a mixture of rolled oats, honey, peanut butter and banana. Banana is added to the bait mixture as it has been found to be effective bait for the Yakka Skink (*Egernia rugosa*). Traps were located 5 to 10 m apart and positioned close to suitable microhabitat features such as fallen logs, dense grass tussocks or areas of surface rock (e.g. exposed rocky outcrops). Traps were checked early in the morning and any animals captured were identified and immediately released. Pitfall and funnel traps were also checked in the afternoon and opportunistically during the day.

Pitfall traps comprised three 20 L buckets dug into the ground to rim level, with a drift fence that intersected the mouth of each bucket and extended beyond the line of buckets to guide fauna towards the buckets. A water soaked sponge, leaf litter and a small piece of polystyrene foam was placed in each bucket to provide moisture and shelter for animals captured. The polystyrene foam is able to be used as a flotation device for captured animals so that they do not drown in the event of heavy rain.

Three sets of two funnel traps were also located along the drift fence to capture larger lizards and snakes that could escape or avoid the buckets. Funnel traps were covered with a towel to provide shelter for captured animals.

A minimum of one person hour of spotlighting and active searching was conducted at each systematic trap site. A minimum of one person hour of early morning bird surveys was also conducted at each trap site, each morning while traps were being checked. One infrared camera was also placed at each systematic trap site.

A brief description of the location and habitat attributes of each of the systematic trap sites is provided in Table 4.

Table 4: Descriptions of habitat at each systematic fauna trap site

Survey Site ID	Site Location (refer Figure 5)	Vegetation Description and Representative Photograph
T1	Central eastern portion of the study area	Lancewood (*Acacia shirleyi*) woodland with scattered emergent Clarkson's Bloodwood (*Corymbia clarksoniana*) and Carbeen (*Corymbia tessellaris*) on minor lateritic rises (RE 11.7.2). Lateritic scalds (exposed ground) were present throughout. Most trees having a diameter at breast height (DBH) of <150 mm. The community had a fragmented canopy and has undergone historic clearing/thinning/ timber harvesting and likely frequent fires. The area has a moderate to high level of fallen timber (generally <150 mm DBH) and moderate level of leaf litter cover. Weed cover is generally low. Substantial surface rocks and boulders are present on scarp edges and slopes. 
T2	Western portion of the study area	Poplar Box (*Eucalyptus populnea*) woodland with occasional Narrow-leaved Red Ironbark (*Eucalyptus crebra*) and Clarkson's Bloodwood woodland on Cainozoic sand plains (RE 11.5.3). Most trees with a DBH of <300 mm with occasional hollows. Sparse fallen timber and limited leaf litter. Native grasses interspersed with patches of exotic grasses. 

Survey Site ID	Site Location (refer Figure 5)	Vegetation Description and Representative Photograph
T3	Central northern portion of the study area nearby Smoky Creek	Poplar Box and occasional Dawson River Gum (*Eucalyptus cambageana*) shrubby woodland on fine-grained sediments (RE 11.9.7a) close to Smoky Creek. Low abundance of hollow bearing trees, low cover of exotic grasses, some fallen timber and few areas of deep leaf litter. The DBH of trees was generally <300 mm. 
T4	South-eastern portion of the study area along Billy's Gully	Mixed Eucalypt and Corymbia riparian forest with River Red Gum (*Eucalyptus camaldulensis*) prevalent on channels (RE 11.3.25). Moderate abundance of microhabitat features such as fallen timber including some large diameter logs and litter. However, large hollow-bearing trees were limited due to historic clearing. Exotic grasses were prevalent. 

Survey Site ID	Site Location (refer Figure 5)	Vegetation Description and Representative Photograph
T5	Central portion of the study area	Mountain Coolabah with occasional taller Variable-barked Bloodwood (*Corymbia erythrophloia*) on basalt rise (RE 11.8.5). Groundcover was primarily exotic with patches of native grasses. Very few hollow-bearing trees were present due to fragmentation and fallen timber and leaf litter was limited. Basalt outcrops and surface rock was prevalent. 
T6	Unnamed tributary of Smoky Creek	River Red Gum and Queensland Blue Gum (*Eucalyptus tereticornis*) with River Oak (*Casuarina cunninghamiana*) riparian vegetation (RE 11.3.25). Occasional mature, hollow-bearing trees. Dense exotic grass cover was present and most vegetation had been cleared to the top of the high bank. There was a low level of fallen timber and little leaf litter. 

Survey Site ID	Site Location (refer Figure 5)	Vegetation Description and Representative Photograph
T7	Central portion of the study area	Clarkson's Bloodwood with Carbeen and occasional Poplar Box open woodland on sand plains (RE 11.5.12). The groundcover was dominated by exotic grasses. Moderate level of large, hollow-bearing trees. Low abundance of fallen timber and leaf litter. 
T8	Western portion of the study area	Poplar Box woodland with occasional Narrow-leaved Red Ironbark (*Eucalyptus crebra*) and Clarkson's Bloodwood woodland on Cainozoic sand plains (RE 11.5.3). Most trees with a DBH of <300 mm with limited hollows. Sparse fallen timber and limited leaf litter. Native grasses interspersed with patches of exotic grasses. 

Supplementary survey sites

A total of 25 supplementary survey sites (S1 – S25) were completed during the field surveys (Figure 5). Techniques employed at supplementary sites included spotlighting, call playback, infrared cameras, bird survey and/or active searching.

A description of the location, survey techniques and vegetation types of the supplementary survey sites is provided in Table 5.

Table 5: Description of supplementary survey sites

Survey Site ID	Site Location (Refer Figure 5)	Survey Techniques	Vegetation Description
Dry season survey			
S1	North-western portion of the study area along Smoky Creek	Bird survey and active search	Narrow fringing River Red Gum, Brigalow and Black Tea Tree (*Melaleuca bracteata*) along Smoky Creek (RE 11.3.25). Some fallen timber, moderate level of flood debris and some areas of deep leaf litter.
S2	Northern portion of the study area along Smoky Creek	Spotlight and Koala call playback	Mature River Red Gums and Black Tea Tree along narrow stretch of Smoky Creek (RE 11.3.25). Some fallen timber, moderate level of flood debris and some areas of deep leaf litter.
S3	South-western portion of the study area	Spotlight and call playback	Poplar Box woodland (RE 11.5.3). Open habitat with a number of hollow trees.
S4	Central-southern portion of the study area	Spotlight and call playback	Sparse woodland of Clarkson's Bloodwood with a dense mid-storey of Bitter Bark (*Alstonia constricta*), Lancewood (*Acacia shirleyi*), Red Ash (*Alphitonia excelsa*) and mostly native grass (RE 11.5.12).
S5	Central portion of the study area	Bird survey and active search	Sparse woodland of Clarkson's Bloodwood (RE 11.5.12). Some fallen timber, few large mature trees and mostly native grasses.
S6	Northern portion of the study area	Bird survey, active search, spotlighting and call playback	Rocky basalt rise with sparse Mountain Coolabah (RE 11.8.5).
S7	Northern portion of the study area	Spotlight and call playback	Open Poplar Box woodland (RE 11.5.3). Very few hollow trees, mostly Buffel Grass (**Pennisetum ciliare*) in the groundcover layer and sparse fallen timber.
S8	South-eastern portion of the study area	Bird survey and active search	Narrow-leaved Red Ironbark and Clarkson's Bloodwood woodlands (ecotone of REs 11.5.8b and 11.5.12). Very little fallen timber or leaf litter. Groundcover was a mix of native and exotic grasses.
S9	Far eastern edge of the study area	Bird survey and active search	Lancewood woodland with a lot of fallen timber and deep leaf litter in places (RE 11.7.2). Mostly native grasses in the groundcover layer.
S10	Central portion of the study area	Bird survey and active search	Clarkson's Bloodwood woodland with understory of Bitter Bark (RE 11.5.12). Sparse fallen timber with mostly native grasses in the groundcover layer.
S11	Central-western portion of the study area	Bird survey and active search	Poplar Box woodland (RE 11.5.3). Moderate levels of fallen timber, some hollow bearing trees and a mix of Buffel Grass and native grasses in the groundcover layer.

Survey Site ID	Site Location (Refer Figure 5)	Survey Techniques	Vegetation Description
S12	Southern portion of the study area along Billy's Gully	Spotlight and call playback	River Red Gum and Carbeen riparian vegetation (RE 11.3.25). Moderate number of hollow trees and minimal fallen timber. Mostly Buffel Grass in the groundcover layer.
S13	Central portion fo the study area	Spotlight and call playback	Clarkson's Bloodwood woodland with understory of Bitter Bark (RE 11.5.12). Few hollow trees, minimal fallen timber and mostly native grasses in the groundcover layer.
Wet season survey			
S14	Central-western edge of the study area	Bird survey	Open cleared areas with scattered trees and long grass near a dam.
S15	Central portion of the study area	Bird survey and active search	Poplar Box woodland (RE 11.5.3). Some mature trees, sparse fallen timber and deep leaf litter. Mostly exotic grasses in the groundcover layer.
S16	Southern portion of the study area along Billy's Gully	Spotlight and call playback	Mixed *Eucalyptus* and *Corymbia* species riparian forest with River Red Gum (RE 11.3.25). Moderate fallen timber and leaf litter. Large hollow trees limited. Exotic grasses prevalent in groundcover layer.
S17	Central-southern portion of the study area	Spotlight and call playback	Clarkson's Bloodwood woodland (RE 11.5.12). Some mature trees, sparse fallen timber and leaf litter. A mix of exotic and native grasses in the groundcover layer.
S18	Central-eastern edge of the study area	Bird survey, active search (diurnal), spotlight and call playback	Lancewood and some Clarkson's Bloodwood (RE 11.7.2). Abundant fallen timber, some areas of deep leaf litter. Mostly native grasses in the groundcover layer.
S19	Southern portion of the study area along Billy's Gully	Bird survey and active search	Mixed *Eucalyptus* and *Corymbia* species riparian forest with River Red Gum (RE 11.3.25). Moderate fallen timber and leaf litter. Large hollow trees limited. Exotic grasses prevalent in groundcover layer.
S20	North-eastern corner of the study area along Smoky Creek	Spotlight and call playback	Narrow fringing eucalypt and Brigalow along Smoky Creek (RE 11.3.25). Some piles of timber debris, some large mature trees.
S21	South-eastern portion of the study area	Spotlight and call playback	Narrow-leaved Red Ironbark woodland with some River Red Gum closer to Billy's Gully (RE 11.5.8b). Moderate abundance of hollow trees, sparse fallen timber and deep leaf litter.
S22	Western portion of the study area	Bird survey and active search	Poplar Box woodland (RE 11.5.3). Some mature trees, mostly Buffel Grass in the groundcover layer. Sparse fallen timber and almost no areas of deep leaf litter.

Survey Site ID	Site Location (Refer Figure 5)	Survey Techniques	Vegetation Description
S23	Central portion of the study area	Bird survey and active search	Clarkson's Bloodwood woodland (RE 11.5.12). Some mature trees, sparse fallen timber and leaf litter. A mix of native and exotic grasses in the groundcover layer.
S24	South-eastern portion of the study area	Bird survey and active search	Non-remnant dense regenerating shrubland, dominated by Bitter Bark, Red Ash and scattered Narrow-leaved Red Ironbark. Moderate cover of small diameter timber, moderate leaf litter and a mix of native and exotic grasses in the groundcover layer.
S25	Central-southern portion of the study area	Bird survey and active search	Poplar Box and Clarkson's Bloodwood woodland (ecotone of REs 11.5.12 and 11.5.3). Mostly Buffel Grass in the groundcover layer, sparse fallen timber and leaf litter. Some mature trees.

Spotlighting

Spotlighting was undertaken on foot for a total of 10 person hours in the vicinity of each systematic trap site, and a total of 14.5 person hours at 12 of the supplementary sites (Tables 3 and 5).

Spotlighting was also undertaken from a slow moving vehicle for a total of 20 person hours along tracks where it was safe to do so. Fauna were located from eye shine or direct observation and identified. The distinctive calls of some fauna were also used to identify their presence.

Call playback

Call playback involved broadcasting a recorded call of an owl or arboreal mammal through a megaphone in an effort to elicit a territorial response from any animals that hear the call. Animals either call in response to the recording and/or move into the location that the call was played from. The call is played and then approximately 2 to 3 minutes are spent listening for a response and looking for animals that have moved into the area without calling. Call playback was undertaken in the vicinity of each systematic trap site and 12 supplementary sites, totalling 20 sessions over both surveys. Following the call playback session, spotlighting was conducted of the immediate area to locate any owls that had flown into the area without calling and had not been seen during the call playback.

The calls of the following species were played:

- Barking Owl (*Ninox connivens*)
- Masked Owl (*Tyto novaehollandiae*)
- Barn Owl (*Tyto alba*)
- White-throated Nightjar (*Eurostopodus mystacalis*)
- Koala *(Phascolarctos cinereus*).

Infrared cameras

A Reconyx HC500 infrared camera was set up at each of the eight systematic trap sites and at another five camera site locations (Figure 5). The cameras were set on a bait station of chicken, apple and sweet potato.

Cameras were set at systematic trap sites (T1 to T8) for a total duration of four nights each, and for 35 nights at each of the additional five camera sites (C1 to C5) during the dry season survey. This is a total of 207 nights for infrared cameras.

Bird surveys

During the checking of traps at each systematic trap site, bird surveys were conducted along the trap transect, with records made of all birds seen and heard. The order in which systematic trap sites were checked varied each morning to ensure that sites were surveyed for birds at slightly different times each day. Five person hours were spent in total at each of the eight systematic trap sites (i.e. 40 hours in total) and 1 person hour was spent conducting bird surveys at 15 supplementary sites resulting in a total survey time of 55 person hours. Opportunistic records of birds were also made while undertaking other activities throughout the project site. Approximately 270 person hours were spent undertaking opportunistic diurnal and nocturnal bird observations during the field surveys.

Active searches

Active searching was conducted to detect reptiles, frogs and small ground dwelling mammals. It involved the searching of suitable microhabitat such as logs, bark, deep leaf litter, surface rocks and shedding bark. Active searching was undertaken for 22 person hours, including 1 person hour at each systematic trap sites and 1 person hour at 14 supplementary sites (Tables 3 and 5).

Anabat

The Anabat surveys involved the use of an SD1 Anabat detector to record the echolocation calls of micro bats as they forage. A sonogram was then produced using software that allows for comparison against reference calls for identification. Unfortunately, some species of bat have very similar and/or quiet calls and cannot be positively distinguished via Anabat (e.g. *Nyctophilus* species). Therefore, a probability rating is provided for calls identified. All Anabat calls were analysed by Greg Ford, a specialist in analysing Anabat recordings.

Anabat units were deployed for one night from dusk until dawn at 16 locations (A1 – A16) (Figure 5). Anabat survey sites were selected on the basis of having suitable flyways, flowering trees that attract insects or water that attracts insects and bats.

Harp traps

Harp Traps were used to capture bats during the survey and were set at seven locations within the study area (H1 – H7) (Figure 5). Harp traps were each set

for 2 nights during the surveys resulting in a total of 14 harp trap nights. Harp traps were located in suitable flyways such as small waterways or tracks. Harp traps comprise two banks of vertical microfilament line offset from one another. Bats fly into one of these wires and drop into a bag beneath the trap where they can be collected for identification. Captured bats were kept in a quiet cool location and released on the night following their capture.

Koala transects

The EPBC Act Protected Matters Search Report and Wildlife Online search for the study area and surrounding areas, indicates the Koala and/or its habitat is known from the search area. Therefore, targeted line transects were conducted in the study area during the seasonal surveys to provide information in relation to the use of the study area by this species. In line with the EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory (DotE 2014), line transects were stratified across the study area to establish an estimate of population density, distribution and habitat preferences (Figure 5). Based on field-validated vegetation mapping described in Section 3.3.6, only communities that contained Koala food trees were sampled.

The methodology employed for the line transects generally involved two ecologists walking a distance of 25 m apart for a length of 500 m on one side of a centreline and then returning along the other side of the 500 m centreline also remaining a distance of 25 m apart, while inspecting each tree along this transect. This approach results in a search area of 5 ha (500 m x 100 m search area) for each transect. A total of 12 line transects were conducted, with this approach applied to 9 of these transects. The remaining 3 transects were conducted in the same manner but traversed the full length of each of the watercourses, rather than stopping at 500 m (Figure 5). The 12 transects resulted in 104.2 ha of potential habitat actively searched.

Opportunistic observations

Records of fauna were also made opportunistically while undertaking other activities, such as moving between trap sites, throughout the survey period.

Habitat assessment

The quality of fauna habitat in the study area was assessed on the basis of the following criteria:

- **Low:** Many fauna habitat elements in low quality areas have been removed or altered such as mature, hollow-bearing trees, fallen timber and deep leaf litter. Remnants are often small in size, support substantial weed infestations of high or moderate threat weeds (e.g. Buffel Grass) and are poorly connected to other areas of remnant vegetation.
- **Moderate:** Some habitat components are present but others are lacking. For example a remnant may have a reasonably intact understorey but lack mature canopy species and fallen timber. Some weed infestations are

present but are relatively small in size or comprise species of low to moderate threat. Linkages with other remnant habitats in the landscape may be lacking or somewhat tenuous.

- **High:** Most habitat components are present (e.g. old-growth trees, fallen timber, lack of weeds and deep leaf litter), the remnant is large enough to support species that are typically associated with large intact areas of habitat (e.g. Masked Owl) and it is well connected or contiguous with other areas of native vegetation.

These criteria were adapted for treeless habitat types such as grasslands or wetlands as appropriate.

3.3.8 Field survey standards

A number of guidelines have been consulted in development of survey methods for this project, particularly with regard to survey timing and techniques employed to target threatened and migratory species and TECs most likely to occur within the study area.

Appendix H provides a comparison of published Commonwealth and Queensland threatened species and communities survey guidelines against the survey effort undertaken for the terrestrial flora and fauna surveys within the study area. Appendix H only includes those species and ecological communities, which were determined as having a moderate or high likelihood of occurrence within the study area prior to the commencement of the field surveys (refer to Sections 3.3.9, 4.3 and 4.4).

Threatened species survey guidelines used to inform the requirements of the terrestrial flora and fauna surveys included:

- Commonwealth guidelines:
    - Survey guidelines for Australia's threatened birds (DEWHA 2010a)
    - Survey guidelines for Australia's threatened bats (DEWHA 2010b)
    - Survey guidelines for Australia's threatened reptiles (SEWPaC 2011a)
    - Survey guidelines for Australia's threatened mammals (SEWPaC 2011b)
    - EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DotE 2014)
    - Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (SEWPaC 2011c)
    - SPRAT databases for relevant EPBC Act listed species and communities, accessed on 14 July 2016.

- Queensland guidelines:
    - Flora Survey Guidelines – Protected Plants Nature Conservation Act 1992 (EHP 2014b)
    - Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2014).

The Commonwealth guidelines provide specific survey guidelines for individual threatened flora and fauna species and ecological communities listed under the EPBC Act, while the Queensland survey guidelines provide general guidance on the survey methodology and minimum effort advice for detection of all species. For all target species, a combination of two or more recommended survey techniques were employed.

3.3.9 Likelihood of occurrence

Ecological community assessment

Flora surveys were conducted at a scale and intensity to sufficiently identify ecological communities present. Ecological communities not recorded during the field surveys were therefore considered to have a low likelihood to occur within the study area.

An assessment of impacts was undertaken for communities identified as present within the study area during the field surveys.

Significant species assessment

Database searches identified threatened, migratory and special least concern species that potentially occur in the study area. The likelihood of these species occurring was then assessed based on the results of the field surveys.

The likelihood of species occurring in the study area was classified using the criteria presented in Table 6. The assessment was based on the species' known ranges and habitat preferences, which were assessed against the characteristics of the study area observed during field surveys.

Table 6: Criteria to assess potential for species to occur in the study area

Likelihood to Occur	Definition
Present	The species was recorded in 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 in the study area during the field surveys, although it is known to occur in the wider region. Habitat was identified for the species in the study area during the field surveys; however, it is marginal, fragmented and/or small in size, or degraded.
Low	The species was not recorded in the study area during the field surveys. The species is either: a) unlikely to occur in the wider region and due to the lack of, or extremely poor quality habitat in the study area, the species is not expected to occur in the study area; or b) may forage periodically in the wider region and may overfly the study area, but the habitat in the study area is generally not suitable.

3.3.10 Threatened species habitat mapping

Habitat mapping was undertaken for threatened flora and fauna species that were recorded as being present in the study area or that were assessed as having a high or moderate likelihood to occur in the study area (refer to Sections 5.3, 6.4 and Appendices I and J).

Habitat mapping was based on detailed field-validated RE mapping to assign areas of habitat based on known habitat preferences, field observations from the study area and previous experience, where applicable.

Habitat preferences for the Squatter Pigeon, Koala and Ornamental Snake were derived from the recent Red Hill Project EPBC Act approval (DotE 2015a), which contains detailed habitat definitions for those species. The definitions from the Red Hill Project EPBC Act approval were used because:

- The habitat definitions in the Red Hill EPBC Act approval relate to general habitat features (e.g. land zones, distances to water etc.), rather than specific locations on the Red Hill Project Site. The habitat definitions are therefore not unique to the Red Hill Project Site and are equally applicable to other projects in the bioregion.
- The Red Hill EPBC Act approval was recently issued (in September 2015).
- The Red Hill Project survey area is located in close proximity to the study area (17 km to the north-west) (refer Figure 3).
- The Red Hill Project survey area and the study area contain similar fauna species, broad vegetation types and habitat features;

Habitat preferences for the Greater Glider were derived from information contained in the conservation advice and SPRAT profile for this species (DotE 2015a). The habitat mapping criteria for each species are described in Section 6.4.

3.3.11 Assessment of impacts

For MNES listed under the EPBC Act, the significance of impacts was assessed in accordance with the Significant Impact Guidelines (DotE 2013). For MSES listed under the EO Act, the Significant Residual Impact (SRI) Guideline (EHP 2014a) was used to assess significance of impacts. The Landscape Fragmentation and Connectivity (LFC) Tool, referred to in the SRI Guideline was used to assess impacts to connectivity. MLES are not defined for the region.

A conservative, risk-based approach was adopted to determine the need for a significance assessment of species under the EPBC Act or EO Act (i.e., an assessment of impacts using the Significant Impact Guidelines, or the SRI Guideline). This approach considers both the likelihood of occurrence of the species within the study area and the potential for habitat loss or disturbance (directly or indirectly) resulting from the project's impacts. This approach ensures that potential project-related impacts on threatened, migratory or special least concern species, which were recorded within the study area or had a moderate or high likelihood to occur within the study area were considered. The criteria for determining if a significance assessment is required are presented in Table 7.

Table 7: Criteria to determine if assessment of significance of impacts from the project is required for significant species

Likelihood to Occur	No potential for habitat loss or disturbance from the project	Potential for habitat loss or disturbance from the project
Present	NO	YES
High	NO	YES
Moderate	NO	YES
Low	NO	NO

3.3.12 Limitations

The timing of the dry season survey did not provide optimal conditions for the identification of many flora species, particularly grasses and herbaceous species, which require reproductive material for identification. Similarly, dry conditions during and preceding the dry season fauna survey period limited amphibian activity. Any limitations related to these dry conditions were, however, overcome during the wet season surveys. The wet season flora and fauna surveys were conducted following significant rainfall in the Moranbah region during February (Tables 1 and 2).

The fauna survey was conducted within the optimal survey timing for the Brigalow Belt bioregion (i.e. March and mid-May) according to the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2014). This is most relevant for detection of the Brigalow Belt reptiles (Ornamental Snake and Dunmall's Snake). Conditions during the wet season survey were conducive to the detection of these species, particularly given there were large numbers of frogs present in riparian areas.

Similarly, the conditions during the wet season flora survey resulted in a significantly increased level of observed flora species richness and plant vigor, particularly within the groundcover layer. Numerous annual herbs and grasses that were absent during the dry season survey were recorded during the wet season survey. Conditions were also conducive to the detection of threatened grasses *Dichanthium setosum* (no common name) and King Bluegrass, which were targeted as part of this assessment.

Nonetheless, ecological survey often fails to record all species of flora and fauna present on a site for a variety of reasons, including seasonal absence or reduced activity during certain seasons or very large home ranges of some animals. Furthermore, the ecology and nature of significant and/or cryptic species means that such species are potentially not recorded during short survey periods. This assessment overcomes these limitations by assessing impacts not only on species recorded during the field surveys, but also on species that are potentially present (based on known distribution and habitat availability).

4 Desktop results

4.1 Overview of environmental values

4.1.1 Geology

As shown on Figure 6 and listed in Table 8, the surface geology of the study area comprises:

- Cainozoic (i.e. Quaternary and Tertiary age) alluvium associated with local drainage features
- a veneer of Tertiary Suttor Formation sediments and associated colluvium
- a highly variable and heterogeneous Tertiary basalt flow
- Triassic sediments of the Rewan Group
- Permian coal measures including the Rangal Coal Measures and Fort Cooper Coal Measures.

Equivalent Land Zones (as defined under the VM Act and in Wilson and Taylor, 2012) are also listed in Table 8, as these are relevant to assigning field-validated vegetation communities to REs within the study area.

Table 8: Surface geology mapping within the study area

Map Symbol	Geological Unit	Lithology	Dominant Rock Type	Equivalent Land Zone
Qa	Quaternary Alluvium	Clay, silt, sand, gravel deposits	Alluvium	3
Qr	Colluvium	Clay, silt, sand, gravel and soil; colluvium and residual deposits	Colluvium and Regolith	4 or 5
TQa	Tertiary – Quaternary Alluvium	Locally red-brown mottled, poorly consolidated sand, silt clay, minor gravel; high-level alluvial deposits	Alluvium	5
Tu	Suttor Formation	Quartz sandstone, clayey sandstone, mudstone and conglomerate; fluvial and lacustrine sediments; minor interbedded basalt.	Sedimentary	9
Tb	Basalt	Mostly olivine basalt flows.	Basalt	8 and 4, where deeply weathered in situ)
Rr	Rewan Group	Lithic sandstone, pebbly lithic sandstone, green to reddish brown mudstone and minor volcanilithic pebble conglomerate (at base).	Sedimentary	9

Map Symbol	Geological Unit	Lithology	Dominant Rock Type	Equivalent Land Zone
Pwt	Fort Cooper Coal Measures	Lithic sandstone, conglomerate, mudstone, carbonaceous shale, coal, tuff, tuffaceous (cherty) mudstone.	Sedimentary	9
Pwj	Rangal Coal Measures	Calcareous sandstone, Calcareous shale, mudstone, coal, concretionary limestone.	Sedimentary	9

4.1.2 Soils

Seven soil types have been identified as occurring within the study area (refer to the EAR Rehabilitation Section). Clay-dominant vertosols, sodosols and dermasols cover the majority of the study area. Localised brown sodosols comprising duplex sandy loams overlying hard, structured clays are present in association within Smoky Creek and its unnamed tributary. Soil types are relevant for assigning vegetation communities to REs within the study area, and are useful for determining areas of preferential habitat for various species.

4.1.3 Surface water

The study area is located in the Isaac River catchment. There are three ephemeral watercourses that traverse the study area, namely Billy's Gully, Smoky Creek and an unnamed tributary of Smoky Creek, which are classified as watercourses under the Water Act and VM Act. Smoky Creek is a fourth order watercourse, and Billy's Gully and the unnamed tributary of Smoky Creek are third order watercourses.

The northern portion of the study area is traversed by Smoky Creek and an unnamed tributary of Smoky Creek. Billy's Gully traverses the southern portion of the study area. The watercourses drain westward towards the Isaac River. During the wet season survey neither watercourse contained flowing water, and only Smoky Creek was noted to contain small isolated pools of water.

A number of water points (farm dams) occur in the study area that are likely to hold water all year round (Figure 5).

4.2 Ecological communities

4.2.1 EPBC Act listed TECs

The EPBC Act Protected Matters Report (Appendix A) listed four TECs, as defined under the EPBC Act, as potentially occurring within the study area, namely:

- Brigalow TEC
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT)
- Weeping Myall Woodlands

- Natural Grasslands TEC.

All of these communities are listed as endangered under the EPBC Act.

4.2.2 Queensland Government vegetation mapping

Approximately one third of the study area is mapped by the Queensland Government as supporting remnant vegetation (Figure 7).

A total of eight REs have been mapped by the Queensland Government as occurring within the study area. This includes six least concern, one of concern and one endangered REs as defined by the VM Act. The status and short descriptions for each of these REs is provided below in Table 9.

The Queensland Government regulated vegetation mapping listed in Table 9 indicates that, within the study area, there are two REs that could potentially form part of TECs listed under the EPBC Act (Section 4.2.1), namely:

- RE 11.3.2 has the potential to form a part of the Weeping Myall Woodland TEC
- RE 11.4.9 has the potential to form a part of the Brigalow TEC

Table 9: Queensland Government mapped REs within the study area

RE Code	Short Description (Queensland Herbarium 2015b)	Conservation Status			BVG (1 M)
		EPBC Act Status[1]	VM Act Status[2]	Biodiversity Status[2]	
11.3.2	*Eucalyptus populnea* woodland on alluvial plains. Contains palustrine wetland (e.g. in swales)	Endangered (only where Weeping Myall (*Acacia pendula*) is a dominant component)	Of concern	Of concern	17a
11.3.7	*Corymbia* spp. woodland on alluvial plains	Not listed	Least concern	Of concern	9e
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines. Riverine wetland or fringing riverine wetland	Not listed	Least concern	Of concern	16a
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains. Contains palustrine wetland (e.g. in swales)	Endangered (only if this RE meets the condition thresholds and key diagnostic criteria for the Brigalow TEC)	Endangered	Endangered	25a

RE Code	Short Description (Queensland Herbarium 2015b)	Conservation Status			BVG (1 M)
		EPBC Act Status[1]	VM Act Status[2]	Biodiversity Status[2]	
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces	Not listed	Least concern	No concern at present	17a
11.5.9c	*Eucalyptus crebra* +/- *Corymbia intermedia* +/- *E. moluccana* +/- *C. dallachiana* woodland	Not listed	Least concern	No concern at present	18b
11.7.2	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Not listed	Least concern	No concern at present	24a
11.8.5	*Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks	Not listed	Least concern	No concern at present	11a

[1] EPBC Act status is only relevant if the RE meets the EPBC Act condition thresholds and key diagnostic criteria for the relevant TEC (TEC status current as at July 2016). Queensland REs are not individually listed under the EPBC Act, but may form part of a TEC listed under the EPBC Act.

[2] VM Act and Biodiversity status defined under the Regional Ecosystem Description Database (REDD) (Queensland Herbarium 2015b).

Vegetation management wetlands

The Queensland Government Vegetation Management Supporting Map indicates that there are no vegetation management wetland areas, within the study area (Figure 7).

Groundwater dependent ecosystems

The Australian Groundwater Dependent Ecosystem Toolbox (GDE Toolbox), prepared by the National Water Commission (2011), defines groundwater dependent ecosystems (GDEs) as:

> *"Ecosystems that require access to groundwater to meet all or some 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 be present within the study area was reviewed, with the review consisting of:

- a search of the Queensland Springs Database;
- a search of the Bureau of Meteorology's (BoM) GDE Atlas; and
- Groundwater field investigations (as described in the EAR Groundwater Report).

A search of the Queensland Springs Database indicated that no spring wetlands are located within the study area.

The BoM GDE mapping (refer Figure 8) indicates several potential GDEs in the study area, including riparian vegetation along Billy's Gully, Smoky Creek and its unnamed tributary, and also areas of remnant vegetation. The EAR Groundwater Section includes a comprehensive description of the groundwater regime. The groundwater assessment was based on the results of fieldwork and monitoring data, and the assessment also included the preparation of a numerical groundwater model.

The EAR Groundwater Report includes water quality data collected from the shallow groundwater within the study area. The shallow groundwater was found to be moderately to highly saline, with an electrical conductivity ranging from approximately 5,000 to 24,000 µS/cm. The groundwater quality within the study area is generally consistent with regional groundwater data collected from equivalent geology. Saline groundwater does not represent a suitable water supply for the vegetation that occurs within the study area.

Consequently, BoM's GDE mapping of the study area does not appear to be consistent with the hydrogeological setting of the study area (i.e. the study area does not contain a suitable shallow groundwater supply). It is concluded that there are no GDEs within the study area and GDEs are not considered further in this report.

Referable wetlands

As part of the Queensland Government's management of wetlands, the EHP has prepared a map of referable wetlands which includes:

- Wetland protection area (WPAs) within the Great Barrier Reef catchment comprising;
    - Wetland of high ecological significant (HES) wetlands
    - Trigger areas that represent the area of hydrological influence of HES wetlands
- Wetlands of general ecological significance (GES).

A search of the referable wetlands map shows there are no WPAs or GES wetlands within or adjacent to the study area. GES wetlands are mapped for the purpose of establishing environmental values, and are not protected wetlands.

4.3 Significant flora species

Database searches encompassing the study area (i.e. at least 25 km radius from the project site boundary) identified a total of nine significant flora species as potentially occurring within the study area. A discussion of the significant flora species identified from database results listed under the EPBC Act and NC Act are provided in Sections 4.3.1 and 4.3.2. Database search results are presented in Appendices A, B and C.

4.3.1 EPBC Act listed flora

Database searches identified two endangered and three vulnerable flora species listed under the EPBC Act as potentially occurring within the study area, as follows:

- *Dichanthium setosum* (no common name) - listed as vulnerable under the EPBC Act
- Black Ironbox (*Eucalyptus raveretiana*) – listed as vulnerable under the EPBC Act
- King Bluegrass (*Dichanthium queenslandicum*) - listed as endangered under the EPBC Act and vulnerable under the NC Act
- Marlborough Blue (*Cycas ophiolitica*) – listed as endangered under the EPBC Act and NC Act
- *Samadera bidwillii* (no common name) – listed as vulnerable under the EPBC Act and NC Act.

These species, along with a description of their preferred habitat, and likelihood of occurrence within the study area are outlined in Appendix I.

4.3.2 NC Act listed flora

In addition to the five EPBC Act listed species discussed in Section 4.3.1, database searches identified the following two endangered and two near threatened species that are listed under the NC Act:

- *Bertya pedicellata* (no common name) –near threatened
- *Cerbera dumicola* (no common name) –near threatened
- *Kelita uncinella* (no common name) –endangered
- *Solanum adenophorum* (no common name) –endangered.

A description of the preferred habitat of these species and assessment of the likelihood of occurrence within the study area is outlined in Appendix I.

Protected plants high risk areas

No high risk areas (HRAs) are mapped within the study area on the Protected Plants Flora Survey Trigger Map (Appendix F) (EHP 2016b).

Essential habitat

No essential habitat for significant flora is mapped for the study area.

4.4 Significant fauna species

Database searches encompassing the study area (i.e. at least 25 km radius from the project site boundary) identified various listed threatened, migratory and special least concern fauna species as potentially occurring within the study area. A discussion of the fauna species identified from database results and listed under the EPBC Act and NC Act are provided in Sections 4.4.1 and 4.4.2. Database search results are provided in Appendices A, B, D, and E, respectively.

4.4.1 EPBC Act listed fauna

Threatened fauna

Database searches identified a total of 15 threatened fauna species listed under the EPBC Act as follows:

- Allan's Lerista (*Lerista allanae*) - listed as endangered under the EPBC Act and NC Act
- Australian Painted Snipe (*Rostratula australis*) - listed as endangered under the EPBC Act and vulnerable under the NC Act
- Corben's Long-eared Bat (*Nyctophilus corbeni*) - listed as vulnerable under the EPBC Act and NC Act
- Curlew Sandpiper (*Calidris ferruginea*) – listed as critically endangered under the EPBC Act
- Dunmall's Snake (*Furina dunmalli*) - listed as vulnerable under the EPBC Act and NC Act
- Ghost Bat (*Macroderma gigas*) – listed as vulnerable under the EPBC Act and NC Act
- Greater Glider (*Petauroides volans*) – listed as vulnerable under the EPBC Act and least concern under the NC Act
- Koala (*Phascolarctos cinereus*) - listed as vulnerable under the EPBC Act and NC Act
- Northern Quoll (*Dasyurus hallucatus*) - listed as endangered under the EPBC Act and least concern under the NC Act
- Ornamental Snake (*Denisonia maculata*) - listed as vulnerable under the EPBC Act and NC Act
- Painted Honeyeater (*Grantiella picta*) – listed as vulnerable under the EPBC Act and NC Act
- Red Goshawk (*Erythrotriorchis radiatus*) - listed as vulnerable under the EPBC Act and endangered under the NC Act
- Squatter Pigeon (southern subspecies) (*Geophaps scripta scripta*) - listed as vulnerable under the EPBC Act and NC Act
- Star Finch (*Neochmia ruficauda ruficauda*) - listed as endangered under the EPBC Act and NC Act
- Yakka Skink (*Egernia rugosa*) - listed as vulnerable under the EPBC Act and NC Act.

A description of the preferred habitat of these species and an assessment of the likelihood of occurrence within the study area is outlined in Appendix J.

Migratory fauna

Database searches (Appendices A, B, D and E) identified a total of 11 birds listed as migratory under the EPBC Act as potentially occurring in the database search area. A description of the preferred habitat of these species and an assessment of the likelihood of occurrence within the study area is outlined in Appendix J.

A number of species listed under the marine provisions of the EPBC Act were also identified in database searches (Appendices A, B, D and E). However, no marine habitat or marine areas occur within 25 km of the project site, therefore, these species have not been considered further.

4.4.2 NC Act listed fauna

Threatened fauna

Thirteen threatened fauna species identified from database searches (Appendices A, B, D and E) are listed as being of conservation significance under the NC Act. Twelve of these species are also listed under the EPBC Act, and are noted in Section 4.4.1. An additional species, the Common Death Adder (*Acanthophis antarcticus*) is listed as vulnerable under the NC Act only.

Special least concern fauna

One special least concern species, the Short-beaked Echidna (*Tachyglossus aculeatus*) was identified from the database searches (Appendices B, D and E) as potentially occurring in the search area.

A number of special least concern migratory birds were also identified in database search results as potentially occurring in the study area (Appendices A, B, D and E). Special least concern animals recorded or considered likely to occur in the study area are discussed in Section 6.4.3.

Near threatened fauna

No fauna species listed as near threatened under the NC Act were identified from database searches for the search area.

Essential habitat

No essential habitat for significant fauna is mapped for the study area (Figure 7).

4.5 Critical habitat

The study area is not within an area identified as Critical Habitat under the NC Act.

4.6 Biodiversity Planning Assessment Mapping

The EHP has prepared a Biodiversity Planning Assessment (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
- local biodiversity significance and/or other values – local values that are of significance at the local government scale.

The BPA mapping is for planning purposes and does not provide any specific statutory protection.

BPA mapping indicates that Smoky Creek and its unnamed tributary in the north of the study area are classified as being of State Biodiversity Significance (Figure 9). Other smaller areas, including Billy's Gully are mapped as being of Regional Biodiversity Significance. The large tract of remnant vegetation in the central portion of the study area is mapped as being of Local Biodiversity Significance.

The study area contributes to a regional landscape of moderately fragmented vegetation, with loosely connecting local tracts of remnant vegetation near to larger State Biodiversity Corridors, e.g. the Isaac River to the south-west of the study area. In the broader landscape these stepping stones and the Isaac River provide corridors to even larger State Biodiversity Corridors to the south and south-west associated with the Denham and Peak Ranges and to the north-east in the Carborough and Kerlong Ranges and beyond, with the Leichhardt and Clark Ranges. In such a fragmented landscape, the larger order watercourses, provide a primary biodiversity connective function.

Section 6.1 describes the value of the study area as a biodiversity corridor (based on site specific fieldwork and mapping).

4.7 Previous studies in the region

A large number of flora and fauna studies have been undertaken within a 25 km radius of the project site over the last several years, as a part of EISs for various other mining projects. These have included the Integrated Isaac Plains Project, Red Hill Project, Millennium Mine Expansion Project, Moranbah South Project, Grosvenor Mine, Caval Ridge Mine, Eagle Downs Mine and Daunia Mine (refer Figure 3).

These surveys identified the following listed threatened fauna species, as relevant to the study area, as being present or likely to be present in the region:

- Squatter Pigeon
- Koala
- Ornamental Snake

- Short-beaked Echidna
- Greater Glider.

The surveys also noted that large areas of land had been cleared in the past for grazing activities. Areas of remnant vegetation were noted to typically comprise Eucalypt and Acacia woodland. The Brigalow TEC was also frequently recorded in the region.

5 Field flora results

5.1 Overview

The study area was found to include approximately:

- 345 ha of remnant vegetation, comprising mostly *Eucalyptus* and *Corymbia* woodland species;
- 35 ha of non-remnant, regenerating shrubby woodland which supports emergent Eucalypt species; and
- 889 ha of cleared and disturbed areas that do not support native vegetation communities.

The distribution of remnant vegetation in the study area is shown in Figure 10. Figure 13 shows broad habitat types, including non-remnant, regenerating shrubby woodland. This figure also shows the extent of cleared and disturbed areas.

Of the areas of remnant vegetation, Clarkson's Bloodwood woodland and Poplar Box woodlands comprise the majority of remnant communities. Historic clearing for agricultural land uses has resulted in a fragmented distribution of remnant vegetation within the study area, however, the vegetation immediately fringing Billy's Gully, Smoky Creek and its unnamed tributary has largely remained intact.

5.2 Vegetation communities

5.2.1 Overview

In accordance with EHP guidance (EHP 2016e), ground-truthing surveys were undertaken to accurately assess the RE type, condition and ecological value of the vegetation proposed to be significantly disturbed by the project. The survey methodology was designed to ensure consistency with relevant State and Commonwealth guidelines, and vegetation communities were identified according to the Queensland Government's Regional Ecosystem Description Database (REDD). The remainder of this report, including the impact assessment, therefore discusses ground-truthed RE mapping, rather than government RE mapping.

Remnant vegetation comprising 10 REs was identified during field surveys in the study area, and is presented in Table 10 and shown on Figure 10. A detailed description of these communities is provided in Appendix K.

Table 10: Field-validated remnant regional ecosystems in the ecology study area

RE Code	Short Descriptions	Conservation status			Other	Area (ha)
		EPBC Act Status[1]	VM Act Status[2]	Biodiversity Status[2]		
11.3.2	Poplar Box alluvial woodland	- [confirmed to not be a component of Weeping Myall TEC within the study area]	Of concern	Of concern	Contains palustrine wetland in swales	1.2
11.3.4	Queensland Blue Gum alluvial woodland	-	Of concern	Of concern	Floodplain (other than floodplain wetlands)	0.5
11.3.25	Mixed eucalypt riparian woodland	-	Least concern	Of concern	Riverine wetland or fringing riverine wetland	48.1
11.5.3	Poplar Box woodland	-	Least concern	No concern at present	-	105.2
11.5.8b	Narrow-leaved Red Ironbark-Queensland Blue Gum woodland	-	Least concern	No concern at present	-	3.4
11.5.9	Narrow-leaved Red Ironbark woodland	-	Least concern	No concern at present	-	9.7
11.5.12	Clarkson's Bloodwood woodland	-	Least concern	No concern at present	-	142.2
11.7.2	Lancewood woodland	-	Least concern	No concern at present	-	14.6
11.8.5	Mountain Coolabah woodland	-	Least concern	No concern at present	-	11.8
11.9.7a	Poplar Box and Dawson River Gum woodland	-	Of concern	Of concern	-	8.5
Total						**345.2**

1 EPBC Act status is only relevant if the RE meets the EPBC Act condition thresholds and key diagnostic criteria for the relevant TEC (TEC status current as at July 2016). Queensland REs are not individually listed under the EPBC Act, but may form part of a TEC listed under the EPBC Act.

2 VM Act and Biodiversity status defined under the REDD (Queensland Herbarium 2015b).

The proposed haul road connections within the Isaac Plains Mine (i.e., beyond the project site, but within the study area) were also inspected. Only a small portion of the proposed haul road connections were found to support remnant vegetation (Figure 10). This is consistent with the Queensland Government remnant mapping of these areas (Figure 7) as well as ground-truthed vegetation

mapping undertaken by Ecotone Environmental Services as part of the Integrated Isaac Plains Project EIS in 2005 and 2006. Approximately 0.9 ha of remnant least concern mixed eucalypt riparian woodland (RE 11.3.25) is present within the haul road connection along the unnamed tributary of Smoky Creek (Figure 10). This amount of remnant vegetation is included in the figures presented in Table 10.

5.2.2 EPBC Act listed communities

Database searches (Appendix A, and discussed in Section 4.2.1) indicated that the following endangered TECs may be present within the study area:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) (Brigalow)
- Semi-evergreen vine thickets of the Brigalow Belt (north and South) and Nandewar Bioregions (SEVT)
- Weeping Myall Woodlands
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (Natural Grasslands).

None of the vegetation communities within the study area satisfied the key diagnostic criteria or condition thresholds to be considered a TEC under the EPBC Act. This is discussed further below.

Brigalow TEC

According to the Brigalow Conservation Advice (TSSC 2013b), Brigalow communities that have greater than 50% perennial weed cover as a percentage of total perennial cover, or Brigalow REs that are not dominated, or co-dominated by Brigalow (*A. harpophylla)*, do not satisfy the condition thresholds or key characteristics that are required for the patch to form part of the Brigalow TEC.

Although Brigalow (*A. harpophylla)* trees were identified in the study area during the field surveys, none formed a dominant canopy layer, and no REs representing Brigalow vegetation were found to be present. Survey transects were conducted in non-remnant areas where Brigalow trees were found to be more common in the north of the study area (at sites S12 and T25 – refer Figure 4). At this location the groundcover layer was dominated by exotic grasses, primarily Buffel Grass (Table 11). Therefore, this vegetation in the study area does not meet the diagnostic criteria of the Brigalow TEC.

Table 11: Condition and status of field-validated non-remnant Brigalow vegetation

Parameter	Non-remnant Brigalow survey transects	
	S12	T25
Height (m)		
T1	14.0	9.2
T2	11.0	*n/a*
S1	5.7	4.2

Parameter	Non-remnant Brigalow survey transects	
	S12	**T25**
Woody Cover (%)		
T1	19.8	10.9
T2	49.2	*n/a*
S1	39.6	18.7
Non-woody (relative %)		
Groundcover - native	0	15.4
Groundcover - exotic	100	84.6
TEC Condition Thresholds	***Fail***	***Fail***

SEVT TEC

Although mixed polygons containing SEVT RE 11.8.13 are mapped just outside the eastern boundary of the study area (Figure 7), no vegetation in the study area was found to represent SEVT communities. Small patches of vine thicket generalist species were identified within the northern portion of RE 11.5.12 (at Q7) and the south-western extent of RE 11.8.5 (at Q21), and as scattered individuals or very small clumps in RE 11.7.2. However, these patches did not constitute a vine thicket RE.

There are no specific diagnostic criteria or condition thresholds referred to in the DotE SPRAT Profile for the SEVT TEC, although reference is made to the Queensland remnant RE mapping methodology with regard to survey methods for SEVT (DotE 2016c).

Weeping Myall Woodlands TEC

A small patch of Poplar Box woodland on alluvial plains (i.e. RE 11.3.2) is mapped in the north-western corner of the study area along a tributary of Smoky Creek (Figure 10). This RE is listed in the EPBC Act Policy Statement 3.17 - Weeping Myall Woodlands (DEWHA 2009), as potentially supporting small patches of the Weeping Myall Woodlands TEC. Condition thresholds for this TEC require that Weeping Myall (*Acacia pendula*) dominate the tree canopy (DEWHA 2009). No Weeping Myall were identified within the patches of RE 11.3.2 or the study area more broadly.

It has therefore been determined that the Weeping Myall Woodlands TEC does not occur in the study area.

Natural Grasslands TEC

There were no REs identified within the study area that corresponded to the Natural Grasslands TEC (as listed in the Listing Advice for this TEC) (e.g. RE 11.8.11), and there were no natural grassland areas or communities identified that met the key diagnostic characteristics and condition thresholds for this TEC.

Non-statutory Queensland Government mapping (Queensland Herbarium, Version 9.0) indicates the possible presence of a patch of RE 11.8.11 (natural grassland) in the northern portion of the study area. Survey transects were

conducted in this area (Figure 4) to determine if the diagnostic criteria and condition thresholds for the TEC would be satisfied (TSSC 2008a).

Table 12 presents the results of each of the three transects located in this area. Field surveys confirmed this area was predominantly dominated by exotic grasses and infestations of Parthenium Weed. The results show that this area fails to meet the definition of Natural Grassland TEC as a result of there being greater than 30% of exotic cover in these areas.

Table 12: Condition and status of field-validated grassland vegetation

Parameter	Non-remnant grassland survey transects[1]		
	1 (S8)	**2 (T18)**	**3**
Area	>5ha	>5ha	>5ha
Indicator Species	**2**	**2**	6
Tussock Number (per hectare)	**<2000**	**<2000**	**<2000**
Woody Shrub Cover (%)	0	0	0
Native Species Cover (%)	15.1	27.5	57.3[2]
Exotic Species Cover (%)	**84.9**	**77.5**	**42.7**
TEC Condition	***Fail***	***Fail***	***Fail***

[1] The parameter(s) highlighted in bold indicate failed criterion.

[2] The high value of native species cover was primarily attributed to Woolly Glycine (*Glycine tomentella*). Native annual and perennial grasses contributed < 1.3 % of the total vegetative cover.

5.2.3 VM Act listed communities

The majority of the vegetation communities in the study area are listed as least concern under the VM Act, however the following three vegetation communities listed as of concern occur in the study area (refer Table 10):

- RE 11.3.2: Poplar Box (*Eucalyptus populnea*) woodland on alluvial plains (Poplar Box alluvial woodland).
- RE 11.3.4: Queensland Blue Gum (*Eucalyptus tereticornis subsp. tereticornis*) and/or *Eucalyptus spp*. on alluvial plains (Queensland Blue Gum alluvial woodland).
- RE 11.9.7a: Poplar Box, False Sandalwood (*Eremophila mitchellii*) shrubby woodland on fine-grained sedimentary rocks (Poplar Box and Dawson River Gum woodland).

No vegetation communities listed as endangered under the VM Act were recorded in the study area (Table 10).

The three of concern communities are discussed in detail below.

RE 11.3.2

Overview

The REDD database contains the following description of this community (Queensland Herbarium 2015b):

> *Eucalyptus populnea* woodland to open woodland. *E. melanophloia* may be present and locally dominant. There is sometimes a distinct low tree layer

dominated by species such as *Geijera parviflora*, *Eremophila mitchellii*, *Acacia salicina*, *Acacia pendula*, *Lysiphyllum spp.*, *Cassia brewsteri*, *Callitris glaucophylla* and *Acacia excelsa*. The ground layer is grassy dominated by a range of species depending on soil and management conditions. Species include *Bothriochloa decipiens*, *Enteropogon acicularis*, *Aristida ramosa* and *Tripogon loliiformis*. Occurs on Cainozoic alluvial plains with variable soil types including texture contrast, deep uniform clays, massive earths and sometimes cracking clays.

Presence in the study area

Approximately 1.2 ha of RE 11.3.2 occurs in the study area. This community was restricted to a small floodplain terrace on the western side of the unnamed tributary of Smoky Creek, in the north-west portion of the study area (Figure 10).

Species and Structural Composition

The canopy layer was found to comprise Poplar Box and associated Sally Wattle (*Acacia salicina*) and Carbeen (*Corymbia tessellaris*). The canopy layer had a median height of 15 m and canopy cover intercept ranging from 5 to 10%. The sub-canopy layer comprised mid-mature Poplar Box and was more representative of the EDL. Sally Wattle was also prevalent in this layer. The sub-canopy had a median height of 10 m and cover intercept ranging from 5 to 20%. The shrub layer comprised Pegunny (*Lysiphyllum hookeri*), Poplar Box and Sally Wattle. The groundcover layer almost exclusively comprised Buffel Grass.

Condition

This community was situated on a narrow terrace between the main channel and the broad clay plains to the east. The community is moderately to markedly fragmented, supporting only scattered mature trees with residual mid-mature regrowth or shrubs. A small, shallow overflow basin was recorded on the eastern edge of the community. Historic clearing and subsequent thinning have affected the community, wherein the community only marginally satisfies the criteria for remnant status (i.e. the 70/50 rule).

RE 11.3.4

Overview

The REDD database contains the following description of this community (Queensland Herbarium 2015b):

> *Eucalyptus tereticornis* woodland to open forest. Other tree species that may be present and locally dominant include *E. camaldulensis, Corymbia tessellaris, E. coolabah, C. clarksoniana, E. populnea* or *E. brownii, E. melanophloia, E. platyphylla* or *Angophora floribunda*. *E. crebra* and *Lophostemon suaveolens* may be locally dominant (subregion 14). A shrub layer is usually absent, and a tall grassy ground layer is often prominent, and may include any of *Bothriochloa bladhii subsp. bladhii, Aristida spp., Heteropogon contortus, Dichanthium spp.* and *Themeda triandra*. Heavily

grazed areas tend to have shorter or annual grasses such as *Dactyloctenium radulans* or *Bothriochloa spp*. Occurs on Cainozoic alluvial plains and terraces. Occurs on variety of soils, including deep cracking clays, medium to fine textured soils, and deep texture-contrast soils.

Presence in the study area

Approximately 0.5 ha of RE 11.3.4 occurs in the study area. This community was limited to a small patch fringing remnant riparian woodland (RE 11.3.25) in the far northern portion of the study area (Figure 10).

Species and Structural Composition

This community was found to typically support a canopy layer dominated by Poplar Box, Queensland Blue Gum, River Red Gum (*Eucalyptus camaldulensis* var. *obtusa*) and Carbeen. The canopy layer had a median height of 18 m and canopy cover intercept ranging from 25 to 30%. The sub-canopy layer comprised Sally Wattle. Less common species included juvenile canopy species, Pegunny and Ironwood (*Acacia excelsa* subsp. *excelsa*). The sub-canopy layer had a median height of 11 m (range 9 to 15 m) and a cover intercept ranging from 10 to 40%. The very sparse shrub layer comprised Pegunny, juvenile canopy species, Leichhardt Bean (*Cassia brewsteri*) and Whitewood (*Atalaya hemiglauca*). The groundcover variously comprised Buffel Grass, Green Panic (**Megathyrsus maximus* var. *pubiglumis*), Indian Blue Grass (**Bothriochloa pertusa*) and Golden Beard Grass (*Chrysopogon fallax*).

Condition

This community was moderately intact within its limited distribution but negatively impacted by a large edge to area ratio. The patch is heavily degraded within the groundcover layer and was found to be actively used by cattle due to the proximity of several water points. Some large hollow bearing trees were observed.

RE 11.9.7a

Overview

The REDD database contains the following description of this community (Queensland Herbarium 2015b):

> *Eucalyptus populnea* predominates forming a distinct but discontinuous canopy (10-15 m high). Other trees may be scattered throughout the canopy. There is generally a dense, tall shrub layer (4-6 m high) dominated by a range of species including *Eremophila mitchellii, Archidendropsis basaltica, Acacia excelsa, Geijera parviflora, Alectryon oleifolius* and *Lysiphyllum carronii*. A low shrub layer is usually present. The ground layer is variable and composed mainly of annual grasses. Occurs on gently undulating to sloping plains. In southern part of bioregion associated with Jurassic Hooray Sandstone. Associated soils are generally moderately deep, hard-setting, solodized solonetz and solodic soils. Brown clays may be present also.

Presence in the study area

Approximately 8.5 ha of RE 11.9.7a occurs in the study area. This community was limited to two patches in the north-east of the study area either side of Smoky Creek (Figure 10).

Species and Structural Composition

The canopy layer was found to comprise mostly Poplar Box, with the occasional Dawson River Gum (*Eucalyptus cambageana*) also present. The height of the canopy ranged from 10 to 15 m (median of 13 m) and had a cover intercept of 15 to 30%. The sub-canopy layer comprised Poplar Box, with Ironwood, Sally Wattle, Western Rosewood (*Alectryon oleifolius* subsp. *elongatus*) and Brigalow less frequently encountered. The sub-canopy layer had a median height of 7 m (range 5 to 9 m) and a cover intercept of 5 to 20%. A sparse shrub layer variously comprised Dead Finish (*Archidendropsis basaltica*), Scrub Boonaree (*Alectryon diversifolius*), Pegunny, Leichhardt Bean and Currant Bush. Buffel Grass dominated the groundcover with **Sida* spp. and Melhania (*Melhania oblongifolia*) also prevalent.

Condition

The southern patch and north-eastern distribution of this community was moderately intact but tended towards even-age regrowth in the west. Exotic grasses primarily dominated the ground cover. However a variety of native herbs were also prevalent.

Wetland vegetation communities

A number of REs identified in the study area, i.e. REs 11.3.2, 11.3.4 and 11.3.25, are described by the Queensland Herbarium as potentially supporting wetlands (Queensland Herbarium 2015).

Within the study area neither RE 11.3.2, RE 11.3.4 or 11.3.25 contain palustrine (vegetated non-channel environments of less than 8 ha, e.g. billabongs, swamps, bogs, springs) or lacustrine (large, open, water-dominated systems larger than 8 ha, e.g. lakes) wetlands. These REs are located along the watercourses within the study area, and have the potential to support small, isolated pools that persist for short durations following flow events. For example, several natural depressions were identified in the stream channel of Smoky Creek and these contained water during the wet season survey period. However, all watercourses in the study area are ephemeral, and given the typically long, dry weather conditions in the area, there is a low likelihood of water persisting for extended periods. The vegetation associated with these watercourses is therefore not considered to be adapted to, nor dependent on, living in wet conditions, and consequently these REs do not meet the definition of a wetland under the VM Act.

5.3 Flora species

A total of 332 flora species were recorded during the field surveys representing 70 families and 203 genera. The dominant family group was *Poaceae* (72

species) with *Fabaceae* (31 species), *Malvaceae* (18 species) also prominent. The dominant family groups exemplify the overall composition and condition of the vegetation communities surveyed, with the ground layer being the most diverse. The species inventory included 38 (11%) exotic species, seven of which are listed as declared pests under the Biosecurity Act. A list of the flora species recorded during the field surveys is presented in Appendix L. The relative abundance of each species, in relation to the REs in which they were found, is also presented in Appendix L.

High average species diversity was recorded in the mixed eucalypt riparian woodland vegetation community (RE 11.3.25) (167 species), the Clarkson's Bloodwood woodland community (RE 11.5.12) (111 species), and the Poplar Box woodland community (RE 11.5.3) (101 species). Moderate to high levels of species diversity (i.e. >70 species) were recorded in the Narrow-leaved Red Ironbark woodland (RE 11.5.9), Lancewood woodland (RE 11.7.2) and Mountain Coolabah woodland (RE 11.8.5) communities. The Narrow-leaved Red Ironbark-Queensland Blue Gum woodland on deeply weathered sandplains (RE 11.5.8b) had the lowest species diversity with 41 species recorded. However, this may be an artifact of only one assessment site being located in this community.

5.3.1 EPBC Act listed flora

No flora species, listed under the EPBC Act, were identified during the field surveys or are considered likely to occur within the study area (refer Appendix I).

5.3.2 NC Act listed flora

No threatened flora species were recorded from the study area or are considered likely to occur (refer Appendix I). Small populations of *Bertya pedicellata* (near threatened under the NC Act) were identified during the field surveys in RE 11.7.2 in lateritic jump-ups in the eastern part of the study area (Figure 11). Near threatened species do not have any specific statutory protection. The populations of *Bertya pedicellata* are located in the eastern part of the study area, well beyond the area proposed to be cleared.

5.4 Exotic flora species

5.4.1 Nationally declared species

The ranking criteria for 'Weeds of National Significance' (WoNS) is based on assessments of the weed's invasiveness, economic, social and environmental impacts, the potential for spread and socio-economic (such as impacts on health, fire risk, and recreational values of land) and environmental values. There is no legislated requirement for the control of WoNS – this task is primarily a state and local government responsibility.

Six WoNS, were identified during the field surveys as follows:

- Rubber Vine (**Cryptostegia grandiflora*)
- Bellyache Bush (**Jatropha gossypiifolia*)

- Tiger Pear (**Opuntia aurantiaca*)
- Common Prickly Pear (**Opuntia stricta*)
- Velvety Tree Pear (**Opuntia tomentosa*)
- Parthenium Weed (**Parthenium hysterophorus*).

Figure 12 provides locations of infestations of these species recorded during the field surveys. However, it should be noted that these records do not represent an exhaustive audit of their location across the study area.

Velvety Tree Pear and Parthenium Weed were most commonly encountered, although Velvety Tree Pear generally occurred in low densities compared with Parthenium Weed. Parthenium Weed occurred as small isolated patches or individuals and also as moderately sized populations, in the mixed eucalypt riparian woodland.

The Tiger Pear and Common Prickly Pear were rarely encountered, having been recorded at only one location each within the project site.

Bellyache Bush was recorded as scattered juvenile specimens in the western extent of Billy's Gully. Rubber Vine was also recorded at this location.

5.4.2 State declared species

At a State level, the Biosecurity Act provides a framework and powers for improved management of pest plants, under which control of pest plants by land owners is enforceable. Seven State restricted exotic species were recorded during the field surveys and are summarised in Table 13. Six of these are also listed WoNS and discussed in Section 5.4.1. The locations of declared weed species are illustrated in Figure 12.

Table 13: State declared pests in the project site

Species	Common Name	WoNS	Biosecurity Act	Regional Ecosystems recorded within
**Cryptostegia grandiflora*	Rubber Vine	WoNS	Category 3	11.3.25
**Harrisia martinii*	Harrisia Cactus	-	Category 3	11.3.25, 11.5.3, 11.5.12, 11.8.5, 11.9.7a
**Jatropha gossypiifolia*	Bellyache bush	WoNS	Category 3	11.3.25
**Opuntia aurantiaca*	Tiger Pear	WoNS	Category 3	11.9.7a
**Opuntia stricta*	Common Prickly Pear	WoNS	Category 3	11.3.25
**Opuntia tomentosa*	Velvety Tree Pear	WoNS	Category 3	11.3.25, 11.5.3, 11.5.12, 11.7.2, 11.8.5
**Parthenium hysterophorus*	Parthenium Weed	WoNS	Category 3	11.3.25, 11.7.2, 11.8.5

5.4.3 Non-declared species

A total of 38 non-declared exotic species were recorded in the project site. Buffel Grass was common throughout the study area, and present in all vegetation

communities. Shrubby Stylo (*_Stylosanthes scabra_), Green Panic, Indian Bluegrass, Red Natal Grass (*_Melinis repens_), Pigweed (*_Portulaca oleracea_) and Sabi Grass (*_Urochloa mosambicensis_) were also commonly encountered throughout the study area.

6 Field fauna results

6.1 Habitat and landscape connectivity

The maintenance of landscape connectivity between patches of habitat is a fundamental aspect of conservation ecology (Endler 1977 Forman 1995). Habitat corridors are often recommended to maintain and/or enhance landscape connectivity (Bennett et al. 1999).

The study area supports a mosaic of remnant vegetation, disturbed vegetation communities and cleared areas. Current and historical disturbance in the form of clearing for agricultural land use, thinning, timber cutting and grazing is evident across the study area.

The watercourses in the study area are mapped as providing connectivity of either state or regional significance (Figure 9). The remainder of remnant communities in the study area, while providing habitat and opportunities for dispersal in the landscape, are less important for connectivity because of the fragmentation between patches and the intervening areas of cleared land, particularly to the south and west.

6.2 Habitat assessment

The quality of fauna habitat throughout the study area is typically poor, as the majority of the area has been cleared for cattle grazing. Figure 13 shows the extent of cleared areas. The study area can be divided into the following four broad habitat types (shown in Figure 13):

- remnant vegetation communities comprising:
  - woodlands and open woodlands
  - lancewood with emergent gums
  - riparian vegetation
- areas of non-remnant vegetation comprising regenerating shrubby woodland with emergent gums.

The values of these habitat types are described below.

Woodlands and open woodlands

Eucalyptus and *Corymbia* dominant woodland communities throughout the study area were considered to be of moderate habitat quality. Mature hollow-bearing trees were moderately abundant and the diversity of ground layer habitat was varied. In some areas there was a moderate abundance of fallen timber (e.g. RE 11.5.12) and native grasses and rocky habitat features (e.g. RE 11.8.5), whereas in many areas fallen timber was sparse and there was a dominance of exotic grasses, particularly Buffel Grass.

All woodland habitats were found to meet remnant status under the VM Act.

Lancewood with emergent gums

Lancewood habitat (RE 11.7.2) was considered to be of high habitat value in the study area due to the moderate to high level of fallen timber, moderate level of leaf litter and generally low weed cover. Substantial surface rocks and boulders were present on scarp edges and slopes, which provide an increased diversity of habitat features. Large hollow-bearing trees were sparse. Emergent gums were present in the form of Clarkson's Bloodwood and Carbeen.

Riparian vegetation

Riparian vegetation within the study area fringing Smoky Creek and its unnamed tributary, as well as Billy's Gully, has moderate habitat value. These communities had a moderate cover of fallen timber and a moderate abundance of hollow bearing trees. However, there was generally a low cover of deep leaf litter and the ground layer was typically dominated by exotic grasses and herbs. Agricultural clearing was evident along some stretches of watercourses up to the high bank of these communities, with a reduced width of vegetation in these areas. This habitat type included a small area of floodplain (RE 11.3.4), which would likely become inundated during high flow events through the unnamed tributary of Smoky Creek.

Regenerating shrubby woodland with emergent gums

This habitat area was considered to be of low to moderate habitat value. It has been historically cleared and now comprises regenerating Quinine Bush, Bitter Bark and Red Ash, which forms a dense shrubland. Emergent Clarkson's Bloodwood and Narrow-leaved Red Ironbark were present. There were only limited tree hollows in this habitat area and the hollows were generally of a small diameter. This area supported a moderate leaf litter and mix of native and exotic grasses.

Cleared and disturbed areas

Expansive areas of the study area have been cleared or substantially disturbed to the extent that they no longer support remnant vegetation. These areas support open exotic pasture with some patches of low shrubby growth or individual native trees, which does not comprise sufficient height or canopy cover to meet remnant status. These areas are considered to be of low habitat value for fauna as they lack many habitat elements such as fallen timber, deep leaf litter or hollow bearing trees. These areas provide suitable habitat for generalist species that are able to adapt to such highly modified environments, and may occasionally be occupied by other more mobile species.

6.3 Fauna diversity

A total of 152 species of terrestrial vertebrate fauna were recorded during the field surveys, including 5 introduced species. Native species included 89 birds, 27 mammals, 28 reptiles and 8 amphibians. A complete list of species recorded is provided in Appendix M.

Species diversity was similar at most trap sites, with site T3 exhibiting greatest diversity and site T1 with the least number of species recorded. The location of the trap sites is shown on Figure 5. Site T3 was located in Poplar Box and Dawson River Gum woodland (RE 11.9.7a) with 37 species recorded, whereas site T1 was in Lancewood woodland on a lateritic jump-up (RE 11.7.2) with only 19 species recorded. Site T2 was located within Poplar Box woodland (RE 11.5.3) and Trap Site T4 was in mixed eucalypt riparian woodland (RE 11.3.25) with 20 species recorded at each site. Trap site T5 recorded 24 species in Mountain Coolabah woodland (RE 11.8.5), site T6 recorded the second highest number of species, 30, in mixed eucalypt riparian woodland (RE 11.3.25), site T7 recorded 26 species in Clarkson's Bloodwood woodland (RE 11.5.12) and site T8 recorded 29 species in Poplar Box woodland (RE 11.5.3) (Figures 5 and 10).

6.3.1 Amphibians

Field surveys recorded 8 amphibian species, including the introduced Cane Toad (**Rhinella marina*). This introduced species was not recorded at any of the eight trap sites, but was recorded at three of the supplementary sites (Appendix M). The majority of species were recorded during the wet season survey at trap sites T5, T6, T7 and T8 and supplementary sites S16, S20 and S21.

The most commonly occurring native amphibians recorded were the Knife-footed Frog (*Cyclorana cultripes*) and Ornate Burrowing Frog (*Platyplectrum ornatum*) (Appendix M).

No threatened or near threatened amphibian species were recorded within the study area, and none are considered likely to occur based on the available habitat present.

6.3.2 Reptiles

Habitat quality for reptiles is strongly influenced by attributes such as leaf litter, fallen logs and debris. The loss of these habitat elements very often occurs in disturbed environments and often leads to reductions in both diversity and abundance of reptiles.

The remnant areas of the study area provide moderate habitat quality for reptiles, with a generally low cover of deep leaf litter and fallen timber and a variable groundcover. However, some areas, for example on land zones 3, 7 and 8 have a diversity of habitats in the ground layer with a high cover of surface rock.

Field surveys recorded 28 reptile species with Bynoe's Gecko (*Heteronotia binoei*), Open-litter Rainbow-skink (*Carlia pectoralis*), South-eastern Morethia Skink (*Morethia boulengeri*), and Ragged Snake-eyed Skink (*Cryptoblepharus pannosus*) most commonly recorded (Appendix M).

The Ornamental Snake, which is listed as vulnerable under both the EPBC Act and NC Act, was recorded in the study area in cleared and disturbed habitat. Further discussion regarding the Ornamental Snake is provided in Section 6.4.1.

No other threatened or near-threatened reptiles are considered likely to occur in the study area.

6.3.3 Birds

A total of 89 birds were identified during field surveys (Appendix M). The most commonly recorded species was the Torresian Crow (*Corvus orru*), Noisy Friarbird (*Philemon corniculatus*), Galah (*Eolophus roseicapillus*), Australian Magpie (*Cracticus tibicen*), Rainbow Bee-eater (*Merops ornatus*) and Pale-headed Rosella (*Platycercus adscitus*). Site T6 provided the greatest diversity of birds, with 21 species recorded in this mixed eucalypt riparian woodland.

The Squatter Pigeon, which is listed as vulnerable under both the EPBC Act and NC Act, was the only threatened bird species recorded in the study area. No other threatened or near-threatened birds are considered to potentially occur within the study area as outlined in Appendix J. Further discussion regarding the Squatter Pigeon is provided in Section 6.4.1.

The Rufous Fantail (*Rhipidura rufifrons*) and Black-faced Monarch (*Monarcha melanopsis*), which are listed as migratory under the EPBC Act, and special least concern (migratory) under the NC Act, were the only other significant bird species recorded in the study area. These species and the likelihood of other migratory birds potentially occurring within study area is discussed in Section 6.4.2.

6.3.4 Mammals

A total of 27 mammal species were recorded during field surveys, including 16 species of microchiropteran bat. The most commonly recorded mammals were the Common Brushtail Possum (*Trichosurus vulpecula*), Little Pied Bat (*Chalinolobus picatus*), Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*), Eastern Cave Bat (*Vespadelus troughtoni*), Gould's Wattled Bat (*Chalinolobus gouldii*) and a broad-nosed bat (*Scotorepens greyii/sanborni*). The Eastern Grey Kangaroo (*Macropus giganteus*) was the most frequently recorded native ground-dwelling mammal (Appendix M).

The Greater Glider was the only threatened mammal species recorded within the study area and is listed as vulnerable under the EPBC Act. The Greater Glider was recorded at five locations in the project site, in mixed eucalypt riparian woodland along both Smoky Creek and Billy's Gully.

The Short-beaked Echidna, which is listed as special least concern under the NC Act, was recorded in the study area. One individual was recorded from Poplar Box woodland (RE 11.5.3) at supplementary site S7 and scats of this species were recorded at sites S1 and S8 in woodland communities (REs 11.5.8 and ecotone between 11.58b/11.5.12, respectively).

One other threatened mammal species, the Koala (listed as vulnerable under the NC Act and EPBC Act), which was not recorded during field surveys, is considered likely to occur in the study area, particularly in riparian areas, due to its known presence in the broader Moranbah region and suitable habitat being present.

These species are discussed further in Sections 6.4.1 and 6.4.3.

The following four feral mammals were recorded:

- Feral Cat *(*Felis catus*)
- Domestic Dog (**Canis lupus*)
- House Mouse (**Mus musculus*)
- European Rabbit *(*Oryctolagus cuniculus*).

Feral animals are discussed further in Section 6.5.

6.4 Threatened and migratory fauna species

6.4.1 EPBC Act listed threatened fauna

The following three EPBC Act listed threatened fauna species were identified within the study area during field surveys:

- Squatter Pigeon (Southern) (vulnerable)
- Greater Glider (vulnerable)
- Ornamental Snake (vulnerable).

Based on a review of database search results and habitat identified in the study area, an assessment of the likelihood of other EPBC Act listed threatened species occurring in the study area has been undertaken, and is provided in Appendix M. This assessment identified one additional listed threatened species that is considered to likely to occur within the study area, namely:

- Koala (vulnerable).

The four species listed above are discussed in more detail in the following sections.

Species recorded within the study area

Squatter Pigeon (Southern)

Species overview

The Squatter Pigeon (southern subspecies) is listed as vulnerable under the EPBC Act and NC Act. This species is known to inhabit tropical dry, open sclerophyll woodlands and occasionally open savannah. It appears to favour sandy soil dissected with low gravelly ridges and is less common on heavy soils with dense grass cover. It is nearly always found in close association with permanent water (Higgins and Davies 1996). This species is also often recorded from areas that do not support remnant vegetation, but in these areas it seems to be associated with clear, disturbed sites such as tracks and stockyards (DotE 2016d); S. Marston Pers. obs.). These habitat areas are likely to provide breeding, foraging and dispersal habitat.

Presence and habitat within the study area

PRESENT

Squatter Pigeons were recorded frequently throughout the study area during both survey periods (Figure 14). Recorded locations comprised both remnant vegetation and cleared areas, often along dirt vehicle tracks and usually within approximately 1 km of a dam. Water sources that still contained water at the time of the October 2015 (dry season) survey were considered permanent water points (typically farm dams) for the purpose of mapping Squatter Pigeon habitat.

As detailed in Section 3.3.10, habitat mapping for the Squatter Pigeon (Figure 14) within the study area has been undertaken in accordance with the Red Hill Project EPBC Act approval definition. Habitat is categorised as follows:

- Suitable Habitat – grassy woodland habitat in REs on land zones 3, 5 or 7, which are either: within 1 km of a permanent water body; or within 1 km of a Queensland Government mapped wetland or ≥3rd order stream (DotE 2015a).
- Unsuitable Habitat – The Squatter Pigeon is considered unlikely to breed or forage elsewhere in the study area due to the proximity of water sources, the presence of unsuitable soils or groundcover. The Squatter Pigeon is noted as being less common in dense vegetation and vegetation with dense grass cover (Higgins and Davies 1996). This would largely preclude the cleared and disturbed areas due to the dominance of Buffel Grass in the groundcover layer. Therefore, all other areas of the study area are mapped as being generally unsuitable for this species except for dispersal purposes.

Based on this definition, there are 181.5 ha of suitable habitat for the Squatter Pigeon in the study area.

Greater Glider

Species overview

The Greater Glider is listed as vulnerable under the EPBC Act and least concern under the NC Act. The Greater Glider is a nocturnal species and uses tree hollows during the day to rest (van Dyck and Strahan 2008a). It may glide over distances of up to 100 m, however, it appears to have low dispersal ability and typically small home ranges of 1-4 ha. The species has an almost exclusive diet of eucalypt leaves and occasionally flowers or buds (TSSC 2016a van Dyck and Strahan 2008a). Although it is known to feed on a range of eucalypt species, it is likely to only forage on one or two species (van Dyck and Strahan 2008a).

The Greater Glider occurs in a range of eucalypt-dominated habitats, including low open forests on the coast to tall forests in the ranges and low woodland westwards of the Dividing Range. It does not use rainforest habitats (van Dyck et al. 2013 van Dyck and Strahan 2008a). This species favours taller, montane, moist eucalypt forests with relatively old trees and abundant hollows and a diversity of eucalypt species (TSSC 2016a).

Presence and habitat within the study area

PRESENT

This species was identified at five locations in the study area, along Smoky Creek and Billy's Gully in mixed eucalypt riparian woodland (RE 11.3.25) (Figure 15).

The approved conservation advice for this species (TSSC 2016a) indicates that taller, moist eucalypt forest with relatively old trees and abundant hollows and a diversity of eucalypt species is favoured by this species. Using this description and in consideration of the communities in which the Greater Glider was observed in the study area and in other surveys conducted throughout Central Queensland, the riparian and alluvial communities are considered to provide suitable habitat for this species. These communities are considered to provide the greatest availability of large old hollow-bearing trees and provide the greatest connectivity with larger patches of remnant vegetation in the landscape.

As detailed in Section 3.3.10, habitat mapping for the Greater Glider (Figure 15) within the study area has been undertaken in accordance with information contained in the conservation advice for this species. Habitat is categorised as follows:

- Suitable Habitat – In line with TSSC conservation advice, remnant riparian and alluvial REs 11.3.2, 11.3.4 and 11.3.25 provide habitat.
- Unsuitable Habitat – The Greater Glider is considered unlikely to be present within other vegetation types in the study area as these lack large, old hollow-bearing trees and a diversity of Eucalypt species. Therefore, these areas are mapped as being generally unsuitable for this species.

Based on this definition, there are 49.8 ha of suitable habitat for the Greater Glider in the study area.

Ornamental Snake

Species overview

The Ornamental Snake is listed as vulnerable under the EPBC Act and NC Act. The Ornamental Snake is found in close association with frogs, which form the majority of its prey. It is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions with clay soils but is also known from lake margins, wetlands and waterways (DotE 2016e).

The SPRAT Profile and Draft Referral Guidelines for the nationally listed Brigalow Belt reptiles specifically describe 'pure grassland associated with gilgais' and 'cleared areas formerly mapped as open-forests to woodlands associated with gilgai formations and wetlands i.e. REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9 and 11.5.16' as suitable habitat for this species (DotE 2016e SEWPaC 2011c).

The Ornamental Snake requires microhabitat features such as cracking clay soils, rotting logs or stumps, coarse woody debris, leaf litter or surface rock. These features are required because they either support the prey food of this

species (i.e. frogs) or provide refuge habitat for the Ornamental Snake (DotE 2016e).

Presence and habitat within the study area

PRESENT

One individual of the Ornamental Snake was detected in the study area during the wet season survey. This individual was recorded on a vehicle track in a cleared area characterised by introduced species (Buffel Grass) and weeds (Parthenium) (Figure 16). No gilgai or wetland habitats were recorded at this location, or indeed anywhere else within in the project site. The area in which the individual was recorded, did not support any suitable microhabitat features such as cracking clay soils, rotting logs or stumps, coarse woody debris, leaf litter or surface rock.

The location where the individual was recorded is approximately 400 m south of Smoky Creek (which has the potential to provide habitat for the Ornamental Snake). The observed record is likely a dispersing individual.

As noted in Section 3.3.10, the Red Hill EPBC Act approval (DotE 2015a) provides a habitat definition for the Ornamental Snake, as follows:

- woodland or open forest habitat, which is included within any Queensland RE on Land Zone 4 and supports gilgai (melon-hole) mounds and depressions; or
- woodland or open forest habitat, which is included within any Queensland RE on Land Zone 3 or 4, or an area of mapped regrowth on Land Zone 3 or 4, which is within 200 m of a mapped wetland or a ≥fourth order stream (as mapped by the Queensland Government) and supports an abundance of fallen logs (>30 cm in diameter) of >10 per 100 m x 100 m sample plot.

There are no gilgai or wetlands within the project site, nor are there any areas of Land Zone 4. Smoky Creek is, however, mapped as a fourth order stream and so has some potential to provide habitat. The vegetation within 200m of Smoky Creek was therefore assessed against the definition of Ornamental Snake habitat provide by DotE in the Red Hill EPBC Act approval. In general, it was found that along Smoky Creek, the cover of fallen logs >30 cm in diameter was substantially lower than 10 per hectare. The vegetation along Smoky Creek does not therefore meet the definition of Ornamental Snake habitat for the purpose of this assessment.

It should also be noted that the study area would also not meet the definition of Ornamental Snake habitat outlined in SPRAT profile and Draft Referral Guidelines (DotE 2016e SEWPaC 2011c), given that there are no gilgais and no vegetation representing REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9 or 11.5.16.

It is therefore considered that there is no suitable habitat in the study area that could sustain a population of this species, and that the observed record is likely a dispersing individual, moving between preferred habitat areas elsewhere, but nearby the study area.

Species assessed as likely to occur in the study area

Koala

Species overview

The Koala is listed as vulnerable under the EPBC Act and NC Act. It is widespread in sclerophyll forest and woodland on foothills and plains on both sides of the Great Dividing Range from about Chillagoe, Queensland to Mt Lofty Ranges in South Australia (Menkhorst and Knight 2011).

Any forest or woodland containing species that are known Koala food trees, or shrubland with emergent food trees provides potential Koala habitat. Koalas are known to occur in modified or regenerating native vegetation communities, and are not restricted to remnant vegetation (DotE 2016f). The EPBC Act referral guidelines for the vulnerable Koala defines Koala food trees as those of the following genus: *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and *Melaleuca.* The guideline also notes that 'primary' and 'secondary' food trees may be referred to in other state or Commonwealth guidelines or policies, however, all are considered to be food trees for the purposes of the EPBC Act referral guidelines for the vulnerable Koala (DotE 2014).

Likelihood of occurrence with the study area

HIGH (refer Appendix J)

The Koala was listed as occurring in the region in database searches (Wildlife Online and the Protected Matters Search Tool). This species or evidence of the species has been recorded in recent EIS field surveys undertaken in proximity to the study area, including:

- Integrated Isaac Plains Project EIS – the Integrated Isaac Plains project site was located approximately 8 km to the south of the study area (note this project has been withdrawn since the publication of the EIS)
- Moranbah South Project EIS – the Moranbah South project site is located approximately 4 km to the south of the study area
- Red Hill Project EIS- the Red Hill project site is located approximately 17 km to the north-west of the study area
- Caval Ridge Project EIS – the Caval Ridge ML is located approximately 11 km to the south-west of the study area.

The location of these mines and projects is shown on Figure 3.

The Koala was not identified in the study area during surveys. The EPBC Act referral guidelines for the vulnerable Koala (DotE 2014) explain, however, that "*Koalas do not necessarily have to be present*" for Koala habitat to be present. The definition of Koala habitat is based on the vegetation community present and the vegetation structure. Based on the habitat definitions contained in these guidelines and the records of the species from the region, the Koala has been assessed as having a high probability of occurrence. This rating is based on:

- The presence of suitable habitat within the study area in the form of woodland vegetation that contains Koala food trees, as defined in the EPBC Act referral guidelines for the vulnerable Koala (DotE 2014).
- A connection between this habitat and habitat in the region where the Koala has been recorded. The Koala has been recorded during field surveys undertaken for a number of other mining projects located within 10 km of the study area (i.e. Grosvenor Project, Integrated Isaac Plains Project, Moranbah South Project, Red Hill Project). The riparian vegetation within the study area provides a connection between these project sites and the Isaac Plains East Project.
- The Koala's ability to move between habitat areas, including its willingness to traverse rural landscapes, modified and disturbed areas in search of habitat (DotE 2016f).

Potential habitat within the study area

As detailed in Section 3.3.10, habitat mapping for the Koala (Figure 17) within the study area has been undertaken in accordance with the Red Hill Project EPBC Act approval definition (DotE 2015a). Habitat is categorised as follows:

- Suitable Habitat – any forest or woodland containing species that are Koala food trees, or any shrubland with emergent Koala food trees (i.e., trees of any of the following genera: *Angophora, Corymbia, Eucalyptus, Lophostemon, Melaleuca*).
- Unsuitable Habitat – Cleared areas, Brigalow and SEVT vegetation types are considered to be generally unsuitable habitat for the Koala.

All of the areas of remnant vegetation within the study area, and particularly the riparian corridors of Billy's Gully and Smoky Creek, are considered to provide habitat for the Koala due to the presence of the Koala feed trees, namely:

- RE 11.3.2 – Carbeen (*Corymbia tessellaris*), Poplar Box (*Eucalyptus populnea*)
- RE 11.3.4 – Carbeen, Poplar Box, River Red Gum (*Eucalyptus camaldulensis* var. *obtusa*) and Queensland Blue Gum (*Eucalyptus tereticornis* subsp. *tereticornis*)
- RE 11.3.25 – Carbeen, Poplar Box, River Red Gum, Queensland Blue Gum, Long-fruited Bloodwood (*Corymbia clarksoniana*), Dallachy's Gum (*Corymbia dallachiana*), Narrow-leaved Red Ironbark (*Eucalyptus crebra*) and Black Tea Tree (*Melaleuca bracteata*)
- RE 11.5.3 – Poplar Box and Narrow-leaved Red Ironbark
- RE 11.5.8b – Poplar Box, Queensland Blue Gum, Long-fruited Bloodwood, Dallachy's Gum, Narrow-leaved Red Ironbark, Poplar Gum (*Eucalyptus platyphylla*) and Yellow-barked Paperbark (*Melaleuca nervosa*)
- RE 11.5.9 – Long-fruited Bloodwood, Dallachy's Gum and Narrow-leaved Red Ironbark
- RE 11.5.12 - Carbeen, Poplar Box, Long-fruited Bloodwood and Yellow-barked Paperbark

- RE 11.7.2 – Carbeen, Long-fruited Bloodwood and Narrow-leaved Red Ironbark
- RE 11.8.5 - Mountain Coolabah (*Eucalyptus orgadophila*) and Variable-barked Bloodwood (*Corymbia erythrophloia*)
- RE 11.9.7a – Poplar Box.

In addition, some areas of non-remnant habitat with emergent gums (such as Narrow-leaved Red Ironbark) are considered potential habitat for this species.

Figure 17 shows areas that have been mapped as suitable habitat. There are 380.1 ha of suitable habitat for the Koala in the study area.

The habitat within the study area has been assessed using the Koala Habitat Assessment Tool in the EPBC Act referral guidelines for the vulnerable Koala (DotE 2014). As outlined in Appendix N, it has been determined that the study area is considered to support habitat critical to the survival of the Koala, with the main factors contributing to this assessment being:

- The habitat in the study area supports 12 potential feed tree species for the Koala
- The habitat in the study area is contiguous with more than 1,000 ha of habitat in the surrounding area
- The remnant vegetation along watercourses in the study area is likely to provide refuge habitat for the Koala, meaning that it may be important for achieving the interim recovery objectives for the Koala.

6.4.2 EPBC Act listed migratory fauna

Two species listed as migratory under the EPBC Act were identified in the study area during the field survey, namely:

- Black-faced Monarch
- Rufous Fantail.

Based on a review of database search results and habitat identified in the study area, an assessment of the likelihood of other EPBC Act listed migratory species occurring in the study area has been undertaken, and is provided in Appendix J. This assessment identified an additional two listed migratory bird species that are considered to have a moderate potential to occur within the study area. These species are:

- Fork-tailed Swift (*Apus pacificus*)
- White-throated Needletail (*Hirundapus caudacutus*).

The four species listed above are discussed in more detail in the following sections. All remnant vegetation in the study area potentially provide habitat, to some extent, for these species and are preferred over cleared or heavily disturbed areas due to the structural diversity of habitats in remnant areas. However, cleared areas may provide foraging habitat for the White-throated Needle-tail and Fork-tailed Swift as these are predominantly aerial species.

Species recorded within the study area

Black-faced Monarch

Species overview

This species occurs in rainforest, eucalypt woodlands and forest (mainly wet sclerophyll), coastal scrubs and rainforest gullies with a dense understorey of ferns and/or shrubs (DotE 2016g, 2015b Pizzey et al. 2012). These habitat communities are described as important habitat under the EPBC Act (DotE 2015b). In Queensland this species occurs generally on the eastern slopes of the Great Divide and occasionally further inland (DotE 2016g).

Presence within the study area

PRESENT

This species was recorded at one location in the study area, in mixed eucalypt riparian woodland along Smoky Creek (RE 11.3.25) during a bird survey. This bird species is likely to use the riparian and alluvial habitat of the study area and may forage in adjacent woodland areas at times. However, this species is only occasionally recorded on the western side of the Great Divide and is considered likely to be an occasional visitor to the Moranbah region. It is considered unlikely that the study area provides important habitat for this species as the habitat is homogenous in the surrounding landscape and would be unlikely to form important breeding habitat for this species.

Rufous Fantail

Species overview

The Rufous Fantail is typically found in rainforest, wet eucalypt forests, monsoon forests, paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, and parks (Pizzey et al. 2012). Important habitat under the EPBC Act is described as moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. A wider range of habitats are used when migrating, including dry eucalypt forests and woodlands and Brigalow shrublands (DotE 2015b).

Presence within the study area

PRESENT

The Rufous Fantail was recorded at one location in the study area during field surveys, in Lancewood woodland (RE 11.7.2), while undertaking a bird survey. It is considered unusual that this species was recorded during the field surveys given the drier habitat types present in the study area. It is likely that the individual recorded was using the study area while in migration. The study area is unlikely to provide important habitat for this species due to the lack of dense, wet and rainforest environments.

Species assessed as having a moderate potential to occur in the study area

White-throated Needletail

Species overview

This species is almost exclusively aerial and occurs over forests, woodlands, farmlands, plains, lakes and towns (Pizzey et al. 2012). It is known from above mainly wooded areas, and larger tracts of vegetation, particularly forest. The species roosts in tree hollows in tall trees on ridge-tops, on bark or rock faces and it is thought to have traditional roost sites (DotE 2015b). Large tracts of forest vegetation and breeding habitat is considered important in Australia (DotE 2015b).

The nearest record of this species is approximately 22 km east of the north-eastern corner of the study area (BirdLife Australia 2015a).

Likelihood of occurrence in the study area

MODERATE (refer Appendix J)

This species was not recorded during the field surveys. There is a moderate likelihood that the White-throated Needletail could overfly the study area as part of a wider foraging range. There is no evidence of traditional roost sites within the study area.

The study area is unlikely to provide important habitat for this species because of the fragmented nature of habitats in the local landscape and the more intact remnant areas present to the north and south, associated with the Denham, Peak Ranges, Carborough and Kerlong Ranges.

Fork-tailed Swift

Species overview

The Fork-tailed Swift is a non-breeding visitor to Australia and is almost exclusively aerial (DotE 2016h). The species is an aerial forager typically over open habitats however, sometimes occurs above rainforests, wet sclerophyll forest or pine plantations and cities (DotE 2016h Pizzey et al. 2012).

The closest record of this species, is approximately 20 km to the north-west of the study area (BirdLife Australia 2015a).

Likelihood of occurrence within the study area

MODERATE (refer Appendix J)

This species was not recorded during the field surveys. There is a moderate likelihood that the Fork-tailed Swift could overfly the study area as part of a wider foraging range. However, it is considered unlikely that the study area provides important habitat for this species as the habitat is homogenous in the surrounding landscape and would be unlikely to form important breeding habitat for this species.

6.4.3 NC Act listed fauna

Two vulnerable and one special least concern fauna species listed under the NC Act have been recorded in the study area, namely the Squatter Pigeon (Southern), Ornamental Snake, and the Short-beaked Echidna. Another vulnerable species under the NC Act, the Koala, is considered likely to occur in the study area. The Squatter Pigeon, Ornamental Snake and Koala are also listed under the EPBC Act, and an overview of these species and suitable habitat within the study area is discussed in Section 6.4.1. The Short-beaked Echidna and other special least concern species are discussed below.

The likelihood of NC Act listed significant fauna species identified in database searches to occur in the study area is presented in Appendix J.

Special least concern fauna species

One special least concern fauna species listed under the NC Act was recorded during the field surveys, namely the Short-beaked Echidna.

Four special least concern migratory species were recorded or assessed as having a moderate likelihood of occurring in the study area, namely the Black-faced Monarch, Rufous Fantail, White-throated Needletail, and Fork-tailed Swift. These species are also listed as migratory under the EPBC Act, and an overview of these species and suitable habitat within the study area are discussed in Section 6.4.2. Special least concern migratory bird species that are not listed under the migratory provisions of the EPBC Act, are not MSES or MNES as defined under the EO Act and will therefore not be discussed further.

An overview of the Short-beaked Echidna and presence of suitable habitat within the study area is provided below.

Short-beaked Echidna

Species overview

The Short-beaked Echidna occurs in almost all terrestrial habitats except intensively managed farmland. It shelters in logs, crevices, burrows or piles of litter and feeds on ants, termites and other soil invertebrates, particularly beetle larvae (Menkhorst and Knight 2011).

Presence and habitat in the study area

PRESENT

This species or evidence of this species was recorded at three locations in cleared and vegetated areas in the study area. While this species is likely to use all areas of the study area for dispersal, remnant vegetation communities are considered to provide more favourable habitat due to the presence of foraging resources such as hollow logs and leaf litter. Approximately 345.2 ha of foraging habitat is present in the study area for this species.

6.5 Feral animals

Five feral animals were recorded during the field surveys (Appendix M). These species are listed under the Queensland Biosecurity Act (refer Section 2.4). Table 14 provides a description of the presence of feral animals in the study area.

Table 14: Feral animals in the study area

Species	Biosecurity Act	Abundance and occurrence in the study area
Cane Toad (**Rhinella marina*)	GBO	The Cane Toad was recorded at 3 of the 25 supplementary sites, and opportunistically throughout the project site.
Feral Cat (**Felis catus*)	Categories 3, 4 and 6	This species was recorded incidentally during drive spotlighting, as well as on an infrared camera at trap site T3. It was also recorded at infrared camera site 2.
Dog (**Canis lupus*)	Categories 3, 4 and 6	Evidence of this species was recorded at trap site T4 and also supplementary site 19.
House Mouse (**Mus musculus*)	GBO	One individual was recorded in a pitfall trap at Trap Site T1.
European Rabbit (**Oryctolagus cuniculus*)	Categories 3, 4, 5 and 6	The European Rabbit was recorded incidentally throughout the project sites as well as at 3 of the 8 trap sites and 4 of the 25 supplementary sites.

7 Impact assessment

7.1 Introduction

This section presents an assessment of the likely impacts of the project on terrestrial ecology with a focus on threatened vegetation communities and flora and fauna species listed under the EPBC Act and NC Act.

The following impacts were considered in the assessment:

- direct impacts from vegetation clearing (Section 7.2)
- indirect impacts such as the effects of noise and vibration, vehicle strike, lighting, dust, erosion and sedimentation, and the introduction or spread of invasive species (Section 7.3).

Assessments of significance have been conducted for each species as per the criteria presented in Table 7, and these are provided in Appendices O and P. The assessments consider both the direct and indirect impacts of the project, and were undertaken in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (DotE 2013) and the SRI Guideline (EHP 2014a), where relevant to Commonwealth or State listed matters.

7.2 Direct impacts

The project layout and disturbance footprint is shown in Figure 2. The project involves clearing of areas of remnant and non-remnant vegetation for open cut mining activities, including for the construction of five open cut pits, overburden emplacement areas, and ROM stockpile areas. Haul roads connecting each of the proposed pits to the existing Isaac Plains Mine road network are also required to be constructed. Clearing along the haul road connections will typically be up to 80 m wide, to allow for construction of the haul road and associated activities. Two haul road crossings are required to be constructed over Billy's Gully and Smoky Creek Northern Tributary.

The proposed disturbance footprint, which covers an area of 611.5 ha, has been configured in a manner that avoids impacts to remnant vegetation, and significant fauna habitat as far as practical. For example, the width of clearing for haul roads will be reduced to approximately 40 m in the vicinity of watercourses and associated riparian vegetation, to minimise the extent of clearing remnant vegetation and associated fauna habitat through these areas. In areas where impacts to vegetation communities, flora species and fauna habitat cannot be avoided, control measures have been designed to minimise impacts on vegetation and habitat as far as practical. These measures are discussed further in Section 8. Clearing will be undertaken gradually over a period of approximately seven years as each open cut pit is progressed and disturbed areas will be rehabilitated once mining has been completed.

Clearing for mining activities will be undertaken gradually over a period of approximately seven years as each open cut pit is progressed. Clearing will cause a direct impact by removing areas of vegetation that may also support habitat features for threatened species.

The vegetation communities within the study area support a range of habitat features, including features which create foraging, shelter and breeding opportunities. However, despite the project resulting in the removal of areas of habitat, extensive areas of land containing similar habitat occurs both within the remainder of the study area and in areas adjacent to the study area. It is anticipated that the types of species utilising the habitat within the disturbance footprint will continue to persist in these adjacent areas where suitable habitat is present. It is also worth noting that vegetation clearing will be undertaken gradually over the seven year life of the project, which will minimise the overall disturbance to habitat areas.

In addition, rehabilitation of mined areas will occur progressively following mining, which will reinstate habitat resources for fauna species (discussed further in Section 8.2.3). The objective of the rehabilitation is to create a stable landform with a self-sustaining vegetation cover for either bushland or grazing land uses, which is similar to current land uses within the study area.

7.2.1 Impacts to vegetation communities

This section provides an assessment of the impacts to vegetation communities that will result from the project.

Approximately 122.3 ha of remnant vegetation will be required to be cleared for the project, with further clearing in areas of non-remnant vegetation, some of which provides suitable habitat for various threatened species. Figure 18 shows the distribution of remnant vegetation communities relative to the disturbance footprint.

Appendix O provides a summary of the remnant REs within the study area, and identifies those that will be cleared for construction of the project. Table 15 provides a summary of the areas of each vegetation community that will be cleared.

Table 15: Remnant vegetation communities within the disturbance footprint

Vegetation Community	Conservation Status		Total area within ecology study area (ha)	Total area to be cleared (ha)
	VM Act[1]	EPBC Act[2]		
RE 11.3.25 Mixed eucalypt riparian woodland	Least concern	-	48.1	**1.4**
RE 11.5.3 Poplar Box woodland	Least concern	-	105.2	**80.1**
RE 11.5.12 Clarkson's Bloodwood woodland	Least concern	-	142.2	**36.2**
RE 11.8.5 Poplar Box alluvial woodland	Least concern	-	11.8	**0.9**

Vegetation Community	Conservation Status		Total area within ecology study area (ha)	Total area to be cleared (ha)
	VM Act[1]	EPBC Act[2]		
RE 11.9.7a Poplar Box - Dawson River Gum woodland	Of concern	-	8.5	**3.7**
			TOTAL (ha)	**122.3**

1 VM Act status defined under the Regional Ecosystem Description Database (REDD) (Queensland Herbarium 2015b)

EPBC Act Vegetation Communities

There are no EPBC Act listed TECs within the study area, and none are predicted to occur. As such, no impacts to EPBC Act listed communities are anticipated.

VM Act vegetation communities

Threatened communities

Clearing for the project will involve the removal of approximately 122.3 ha of remnant vegetation within the study area (Figure 18). The majority of this vegetation (120.0 ha) supports REs with a least concern status under the VM Act (Table 15). The remaining vegetation that will be cleared comprises 3.7 ha of of concern RE 11.9.7a. This RE is classified by the Queensland Herbarium as having a sparse structure. There are no endangered REs within the disturbance footprint.

Offsets are required under the EO Act for significant residual impacts on remnant of concern REs. The SRI Guideline (EHP 2014a), provides thresholds for clearing in remnant endangered and of concern vegetation that constitute a significant residual impact and trigger the provision of an environmental offset. With reference to the significant residual impact criteria for regulated vegetation contained in Table 1 of the SRI Guideline, a significant residual impact will result from clearing more than 2.0 ha of remnant of concern REs with a sparse structure. The proposed clearing area of 3.7 ha of RE 11.9.7a exceeds this criterion and offsets are therefore required. Environmental offsets are detailed in Section 9.3 and Appendix Q.

REs within a defined distance of a watercourse

In accordance with the Queensland Offsets Regulation 2014, remnant REs that occur within certain distances of watercourses are classified as MSES. Clearing in these watercourse REs can trigger an environmental offsets under the EO Act.

There are three watercourses within the study area, Smoky Creek (4th order stream), Billy's Gully (3rd order stream), and an unnamed tributary of Smoky Creek (3th order stream). These drainage features are associated with remnant vegetation, namely least concern RE 11.3.25 (Mixed eucalypt riparian woodland). This RE is classified by the Queensland Herbarium as having a mid-dense structure.

Areas of RE 11.3.25 associated with both the unnamed tributary of Smoky Creek and Billy's Gully will be required to be cleared for the construction of linear infrastructure associated with the haul road connections (Figure 18). The haul road connections are approximately 80 m wide, to allow for construction of the haul road and associated infrastructure. However, in the vicinity of watercourses and associated riparian vegetation, the width of the haul roads will be reduced to approximately 40 m to ensure clearing of remnant vegetation through these areas is minimised. It is therefore expected that the proposed clearing will not give rise to significant impacts on riparian vegetation.

Appendix 3 of QEOP, lists the defined distance of REs for 3rd or 4th order streams as 50 m from the defining banks. Approximately 0.7 ha of RE 11.3.25 is located within this defined distance, and will be cleared for the construction of haul roads (refer Figure 18).

With reference to the significant residual impact criteria for regulated vegetation contained in Table 1 of the SRI Guideline, a significant residual impact will result from clearing for linear infrastructure of greater than 10m wide in an RE of mid-dense structure. The proposed clearing area of 0.7 ha of RE 11.3.25 exceeds this criterion and offsets are therefore required. Environmental offsets are detailed in Section 9.3 and Appendix Q.

7.2.2 Impacts to threatened flora species

EPBC Act flora species

No threatened flora species listed under the EPBC Act were found within the study area, and none are predicted to occur. As such, no impacts to EPBC Act listed flora are anticipated.

NC Act flora species

No threatened flora species under the NC Act were recorded in the study area, and none are predicted to occur. As such, no impacts to NC Act listed threatened flora are anticipated.

7.2.3 Impacts to significant fauna species

This section provides an assessment of the impacts to significant fauna species that will result from the project.

Approximately 122.3 ha of remnant woodland and open woodlands and riparian vegetation is proposed to be cleared over the life of the project, along with 2.5 ha of non-remnant, emergent woodland that provides habitat for a range of fauna species, including species of conservation significance listed under the EPBC Act and NC Act.

Appendix O provides a detailed breakdown of all areas of habitat within the study area. Table 16 provides a summary of the areas of fauna habitat that will be cleared. Note the clearing areas provided in this table overlap in some instances, and therefore cannot be added.

Table 16: Suitable fauna habitat within the disturbance footprint

Species	Likelihood of occurrence within the ecology study area	Conservation Status		Total area of suitable habitat within ecology study area (ha)	Total area of suitable habitat to be cleared (ha)
		NC Act	EPBC Act		
Squatter Pigeon (southern)	Present	Vulnerable	Vulnerable	181.5	**73.7**
Greater Glider	Present	Least concern	Vulnerable	49.8	**1.4**
Koala	High	Vulnerable	Vulnerable	380.1	**124.8**
Short-beaked Echidna	Present	Special least concern	Not listed	345.2	**122.3**
Black-faced Monarch	Present	Special least concern	Migratory	345.2	**122.3**
Rufous Fantail	Present	Special least concern	Migratory	345.2	**122.3**
White-throated Needletail	Moderate	Special least concern	Migratory	345.2	**122.3**
Fork-tailed Swift	Moderate	Special least concern	Migratory	345.2	**122.3**

Note the clearing areas provided in this table overlap in some instances, and therefore cannot be added

EPBC Act listed fauna species

Threatened fauna

Three EPBC Act listed threatened fauna species are considered to have suitable habitat within the study area that will be impacted by the project, namely the Squatter Pigeon (southern subspecies), Greater Glider and Koala. Figures 19 to 21 present the extent of habitat for these species in relation to the proposed disturbance footprint. A range of mitigation measures will be implemented for the project to reduce impacts to fauna during the clearing phase of the project. These are presented in Section 8.

Squatter Pigeon

EPBC Act Status: Vulnerable

NC Act Status: Vulnerable

The Squatter Pigeon was recorded frequently during both survey periods throughout the study area (Figure 14). Recorded locations comprised both remnant vegetation and cleared areas, often along dirt vehicle tracks and usually within approximately 1 km of a dam. Approximately, 181.5 ha of Squatter Pigeon (southern subspecies) habitat has been identified within the study area (Table 16; Figure 14). There are a considerable number of records for this species in the locality and large areas of similar habitat occur to the north, east, south and west of the study area.

The project would result in the clearing of approximately 73.7 ha of habitat for the Squatter Pigeon (southern subspecies) (Figure 19). However, this is a highly mobile species and is known to disperse across cleared and degraded landscapes between preferred habitat areas. The removal of this habitat is unlikely to isolate any populations of this species due to their mobility.

An assessment of significance has been conducted for the Squatter Pigeon (southern subspecies) according to the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (DotE 2013) for vulnerable species (Appendix P). The assessment concluded that the project is considered unlikely to result in a significant impact to the Squatter Pigeon as the species remains common in its northern distribution, the study area is unlikely to support an important population (as defined in the EPBC Act Significant Impact Guidelines, (DotE 2013), and extensive habitat occurs elsewhere in the region.

Offsets are therefore not required for impacts on the Squatter Pigeon, given that the project is not predicted to give rise to a significant, residual impact on this species.

Greater Glider

EPBC Act Status: Vulnerable

NC Act Status: Least concern

The Greater Glider was identified at five locations in the study area, along Smoky Creek and Billy's Gully in mixed eucalypt riparian woodland (RE 11.3.25) (Figure 15). A total of 49.8 ha of habitat has been mapped for this species in the ecology study area, primarily in association with riparian communities (Section 6.4.1 and Figure 15). These areas support a greater diversity of Eucalypt species and larger older trees that are more likely to provide hollow habitat for this species.

A total of 1.4 ha of suitable Greater Glider habitat is proposed to be cleared for the project. This clearing is primarily associated with the proposed haul road crossings of Billy's Gully and the unnamed tributary of Smoky Creek (Figure 20). This clearing may cause some fragmentation of riparian habitat and may affect dispersal opportunities for this species to some extent. However, the haul road corridors are only 40 m wide in riparian vegetation, and Greater Gliders are known to glide distances of up to 100 m (van Dyck and Strahan 2008b).

An assessment of significance has been conducted for the Greater Glider (according to the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (DotE 2013) for vulnerable species (Appendix P). The assessment concluded that the project is considered unlikely to result in a significant impact to the Greater Glider, given that only a small area of habitat is proposed to be cleared, and habitat will remain in the broader landscape.

Offsets are therefore not required for impacts on the Greater Glider, given that the project is not predicted to give rise to a significant, residual impact on this species.

Koala

EPBC Act Status: Vulnerable

NC Act Status: Vulnerable

The Koala was not identified in the study area during the field surveys, undertaken over two seasons. However, it is considered to have a high likelihood of occurrence as it is known from the local area, and the study area supports a number of potential Koala feed tree species (Figure 18). Approximately 380.1 ha of Koala habitat has been mapped within the study area, including areas of remnant riparian vegetation which provides the highest value habitat for the Koala in the study area (Section 6.4.1 and Figure 21). With reference to the Koala Habitat Assessment Tool in the EPBC Act referral guidelines for the vulnerable Koala (DotE 2014), the habitat has a score of 6 and is considered critical habitat for the species (refer to Appendix N).

The project would result in the removal of 124.8 ha of habitat. EPBC Act Policy Statement 1.1 Significant Impact Guidelines (DotE 2013) for vulnerable species provides guidance on the factors to be considered in determining whether an impact is significant. An Assessment of Significance has been prepared for this species in accordance with this guideline and is provide in Appendix P. The EPBC Act referral guidelines for the vulnerable Koala (DotE 2014) were consulted in preparing this assessment to assist with determining whether the impact is considered to be significant.

The EPBC Act referral guidelines for the vulnerable Koala (DotE 2014) provide advice on the various factors that should be considered in determining whether an impact is significant. One of these factors is the potential of a project to adversely affect habitat critical to the survival of the Koala. Figure 2 in the referral guidelines (DotE 2014) provides various thresholds, in terms of areas of impacted habitat that could be anticipated to give rise to adverse effects on habitat critical to the survival of the Koala. For example, clearing <2 ha of habitat with a score of 5 is not anticipated to give rise to adverse effects on habitat critical to the survival of the Koala, whereas clearing >20 ha of habitat with a score of >8 is anticipated to give rise to adverse effects on habitat critical to the survival of the Koala.

The project involves clearing 124.8 ha of habitat with a score of 6. According to Figure 2 in the referral guidelines (DotE 2014), the impacts of this clearing are “uncertain” and the impacts should be considered on a case by case basis, and the guideline provides various factors that should be considered in this instance. These factors have been considered in the Assessment of Significance for the Koala (provided in Appendix P). The Assessment of Significance concluded that the project is not anticipated to give rise to significant impacts on the species.

Key considerations in this assessment are the likely low density of Koalas in the study area (Koalas were not recorded during two field surveys, and no scats or scratches were observed) and the fragmented, disturbed nature of the vegetation within the study area. The study area is currently used for cattle grazing, with much of the vegetation having been subject to historic clearing

activities. In addition, the project has been designed to avoid clearing of remnant vegetation were possible, and only involves very limited clearing of riparian vegetation which provides the highest value habitat for the Koala in the study area. The riparian vegetation in the study area will therefore continue to provide connectivity to other areas of habitat beyond the study area.

Offsets are therefore not required for impacts on the Koala, given that the project is not predicted to give rise to a significant, residual impact on this species.

Migratory fauna

Two migratory fauna species were recorded in the study area during field surveys, namely the Black-faced Monarch and Rufous Fantail. An additional two migratory species have a moderate likelihood of occurring within the study area, namely the White-throated Needletail and Fork-tailed Swift.

The study area supports a range of habitat types that are likely to be used by the above migratory species as they move throughout the locality. It has been assumed for the purposes of this report, that areas of remnant vegetation could provide potential habitat for migratory species. The project will therefore result in the clearing of approximately 122.3 ha of habitat for migratory birds (Table 16).

Despite this clearing, areas of potential habitat will remain within the study area, particularly within riparian areas. Large areas of habitat also occur in the broader region.

An assessment of significance for the migratory species listed above has been conducted in accordance with the EPBC Act Significant Impact Guidelines (DotE 2013) for listed migratory species (Appendix P). This assessment concluded that the habitat within the study area is not considered to be “important habitat” (as defined in the EPBC Act Significant Impact Guidelines, (DotE 2013) for these species. Further, there is no evidence that the study area supports an ecologically significant proportion of the population of these migratory species. Offsets are therefore not required for impacts on migratory species, given that the project is not predicted to give rise to a significant, residual impact on these species.

NC Act listed fauna species

Threatened fauna

Two NC Act listed threatened fauna species are considered to have suitable habitat within the study area, namely the Squatter Pigeon (southern subspecies), and Koala. These species are also listed under the EPBC Act, and have been addressed in the previous sections.

Special least concern fauna

The Short-beaked Echidna was the only special least concern fauna species (non-migratory) recorded in the study area.

The Short-beaked Echidna has broad habitat preferences, and for the purposes of this report all areas of remnant vegetation are considered to provide suitable habitat for this species (Section 6.4.3). The project will therefore result in the clearing of approximately 122.3 ha of suitable habitat for the Short-beaked Echidna (Table 16). Despite this reduction of habitat available in the study area, a large area of suitable habitat remains within the study area and connectivity to retained habitat and adjoining vegetation communities will not be substantially interrupted.

An assessment of significance was undertaken for the Short-beaked Echidna in accordance with SRI Guideline (EHP 2014a) (Appendix R). Based on this assessment, the project is unlikely to have a significant residual impact on this species, due to the broad habitat preferences and mobility of this species.

Offsets are therefore not required for impacts on the Short-beaked Echidna, given that the project is not predicted to give rise to a significant, residual impact on these species.

7.2.4 Summary of impacts

Table 17 provides a summary of the impacts to each of the Commonwealth and State matters discussed above. Please note, the total areas of impact presented in this table cannot be added together, as in some instances, these areas overlap.

Table 17: Summary of impacts

Protected Matter	NC Act Status	EPBC Act Status	Likelihood of occurrence	Total area in ecology study area (ha)	Total area to be cleared (ha)	Significant impact likely?[1]
Regulated Vegetation – RE 11.9.7a	Of concern	Not listed	Present	8.5	3.7	Yes
Watercourse RE - RE 11.3.25	Least concern	Not listed	Present	38.9	0.7	Yes
Squatter Pigeon (southern)	Vulnerable	Vulnerable	Present	181.5	73.7	No
Greater Glider	Least concern	Vulnerable	Present	49.8	1.4	No
Koala	Vulnerable	Vulnerable	High	380.1	124.8	No
Black-faced Monarch	Special least concern (Migratory)	Migratory	Present	345.2	122.3	No
Rufous Fantail	Special least concern (Migratory)	Migratory	Present	345.2	122.3	No
White-throated Needletail	Special least concern (Migratory)	Migratory	Moderate	345.2	122.3	No
Fork-tailed Swift	Special least concern (Migratory)	Migratory	Moderate	345.2	122.3	No

Protected Matter	NC Act Status	EPBC Act Status	Likelihood of occurrence	Total area in ecology study area (ha)	Total area to be cleared (ha)	Significant impact likely?[1]
Short-beaked Echidna	Special least concern	Not listed	Present	345.2	122.3	No

[1] assessment of impacts in accordance with the EPBC Act Significant Impact Guidelines (DotE 2013) and the EO Act QEOP and SRI Guidelines (EHP 2016a, 2014a)

7.3 Indirect impacts

The project will have a range of indirect impacts on the ecological values of the remaining vegetation and habitat within the study area. The potential for indirect impacts to occur as a result of the project is predominantly related to:

- habitat fragmentation and edge effects due to vegetation clearing
- the potential spread of weeds and pest animals
- creation of noise and dust as a result of mining activities
- potential vehicle strike due to haul truck movements
- erosion of disturbed areas and sedimentation of watercourses.

7.3.1 Habitat fragmentation and edge effects

Vegetation clearing can result in the fragmentation of habitat which can impact flora and fauna species. The clearing for the project has the potential to fragment fauna habitat and create barriers (i.e. cleared corridors) which may impair movement of some fauna species, and impact connectivity of habitat. In some areas fragmentation may isolate some smaller vegetation polygons. However, many areas within the study area are already fragmented due to historic land management practices. Given the open structure of the woodland and open forest habitat in the study area, coupled with the already heavily fragmented vegetation, it is considered unlikely that the project will significantly impact flora and fauna species due to fragmentation of habitat.

The riparian vegetation provides the most significant habitat corridors in the study area. Some clearing in riparian areas is required for the project for the construction of linear infrastructure associated with haul roads (Figure 18). However the width of clearing for the haul roads in the vicinity of watercourses and associated riparian vegetation will be minimised to reduce impacts to riparian vegetation. In addition, the project mine plan does not include mining within the floodplains of the watercourses that traverse the study area. In particular, the mine has been designed to ensure that there will be no mining within the 0.1% Annual Exceedance Probability (AEP) (1 in 1,000 year) flood extents of Smoky Creek and Billy's Gully. This will allow the riparian vegetation habitat corridors to essentially remain intact, but for the limited clearing for the haul road crossings.In accordance with the EHP's 2014 Significant Residual Impacts Guideline, EHP's Landscape Fragmentation and Connectivity (LFC) Tool was used to assist in identifying and quantifying any significant impact as a result of the project on habitat connectivity. EHP's LFC 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. The output of the LFC Tool is presented in Appendix S.

7.3.2 Pest animals and plants

The study area is located within a highly modified landscape of historic grazing activities, where weeds, introduced plants and some feral predators are present.

At the time of the field survey, seven Queensland declared pest plants were detected within the project site with Parthenium Weed, Velvety Tree Pear and Harrisia Cactus being relatively common or widespread (refer Section 5.4). The exotic Buffel Grass, not a declared weed, but a significant environmental weed was also common throughout the study area. Given that the study area is already highly disturbed, project activities are unlikely to increase weed populations any more than existing activities on the site (including grazing activities).

Pest animals that were identified in the project site during field surveys included the Cane Toad, Dog, Feral Cat and European Rabbit (refer Section 6.5). It is likely that other species such as Foxes are also present. The project itself is unlikely to introduce new pest animals to the area as these types of animals are able to move freely throughout the landscape and/or readily colonise new areas. Vegetation clearing activities may temporarily attract some predatory feral animals.

Although the project is unlikely to result in the increase of weed species in the study area, and will not facilitate the expansion of existing populations of pest animals, Isaac Plains Mine has existing procedures in place for weed and feral animal control, and these will be applied to the project (refer to Section 8.2.4).

7.3.3 Dust

Construction and mining activities have the ability to generate dust, which has the potential to impact vegetation and fauna. Increased levels of dust could reduce the health of vegetation along the edge of mined areas and haul roads, impact potential foraging resources for wildlife, and influence faunal abundance. However, recent studies on the impacts of dust from unsealed roads, including haul roads, on vegetation and fauna, have found no evidence that dust has any detrimental impacts on vegetation or fauna abundance (Cumberland Ecology 2015 Jones et al. 2016).

Isaac Plains Mine has standard dust minimisation and suppression strategies, such as watering haul roads, and these strategies will also be implemented for the project to minimise the creation of dust (dust mitigation measures are discussed further in the EAR Air Quality Section). In addition, mining for the project will be undertaken progressively over a seven year period, and therefore dust will only be generated from active mining areas. Mined areas will also be progressively rehabilitated and vegetated following mining, which will also reduce the potential for dust generation. Dust is therefore not likely to cause a significant impact on the ecological values of the study area.

7.3.4 Noise and vibration

Noise and vibration emissions associated with the project will be generated from various sources, such as mining equipment, excavators, and blasting activities.

Most fauna species exhibit a high degree of adaptability to noise impacts. Noise from mining activities may cause some behavioural modification by birds, such as altering feeding activity, and sudden loud noises may also startle bird and mammal species. Consequently, depending on the magnitude of construction and operational noise, some species are likely to move in response to noise, and therefore the habitat value of the woodlands remaining in the immediate vicinity of open cut mining and mine infrastructure areas may decrease. The size of the disturbance zone is likely to be different for individual species and will depend upon the intensity and nature of the noise sources. It is not possible to quantify the proportion of the local fauna community that will be adversely affected by noise impacts, but it is expected to be a minority of species, and noise impacts on fauna are unlikely to occur over a significant distance from the noise source. In the case of temporary noise associated with project construction or clearing activities, native fauna are likely to return to affected habitat areas within a short period of the noise emissions ceasing.

The area is already affected, to an extent, by noise impacts due to the proximity of the existing Isaac Plains Mine immediately to the west of the project, the Peak Downs Highway to the south, and the Goonyella Rail Line to the north. It is not possible to quantify the proportion of the local fauna community that will be adversely affected by noise impacts from the project, but it is expected to be a minority of species, and noise impacts on fauna are unlikely to occur over a significant distance from the noise source. Noise impacts will only occur during the active life of the project (anticipated to be seven years), and native fauna are likely to return to affected habitat areas within a short period of the noise emissions ceasing. Noise from the project is therefore not likely to cause a significant impact on the ecological values of the study area.

Impacts on fauna from ground vibration (e.g. from blasting) will be similar to noise disturbance. It is possible that some species would move away from areas close to the vibration source, where the intensity of the vibration exceeds the tolerance of the species. This is likely to be greatest in the vicinity of the open cut pit but is also considered a temporary impact. The ecological values of the study area are therefore not likely to be impacted, in the long term, by ground vibration from the project.

Specific noise and vibration mitigation measures are in place for the Isaac Plains Mine, and these will be implemented for the project. These mitigation measures are discussed in the EAR Noise Report.

7.3.5 Light

The project has the potential to increase the level of artificial light in the study area. Light spill may disturb some species of fauna. Impacts of light may include some animals being attracted to the artificial light source and other species avoiding the light source due to increased risk of visibility and predation. Some

interactions between fauna can be masked or interrupted as a result of the increased light source. It is likely however, that most fauna species would habituate to the levels of artificial light or temporarily move away from areas of night lighting and return once the night lighting has ceased. The extent of impact of lighting will vary between species and habitat types as light shed will be greater in more open habitat types.

Some intermittent lighting impacts are likely to already be experienced in the study area from the adjacent Peak Downs Highway and Goonyella Rail Line. Night lighting from the adjacent Isaac Plains Mine may also contribute to existing night lighting impacts within the study area.

There are relatively limited sources of light proposed within the project site. The key light sources will be limited to the operating dragline within the pits, mobile lighting plants for operating pit and overburden emplacement work areas, and lighting of crib huts, and vehicle headlights. At any one time, only a small proportion of the project site would experience any impacts from lighting of mining areas, given lights will only be used in the operating areas of the mine at night. The impacts from lighting are likely to remain close to the light source, with only limited glare into the surrounding natural vegetation. Lighting impacts on fauna from vehicles travelling along the haul roads will be brief and intermittent.

Lighting is therefore not likely to significantly impact fauna species.

7.3.6 Vehicle Strike

The construction and operation of haul roads as part of mining projects may impact fauna through increased risk of vehicle strike, leading to injury and mortality. Ground-dwelling fauna are the most susceptible to vehicle strike, although birds and micro-bats may also be impacted. Haul roads for this project are proposed to be located largely within cleared areas (Figure 18), which would reduce the incidence of vehicle strike. Nevertheless, some mortality of animals as a result of vehicle strike is likely, particularly in areas where haul roads cross through remnant vegetation. This impact is, however, not expected to be significant and the impact would only occur for the duration of mining activities (approximately seven years).

The project will be subject to the same internal procedures that are in place at the Isaac Plains Mine in relation to speed limits and safe driving practices.

7.3.7 Erosion and sedimentation

The project has the potential to result in erosion of disturbed areas and sedimentation of waterways within the project site through the clearing of vegetation for the development of open cut pits, and construction of haul roads and other infrastructure. Erosion may result in elevated levels of suspended sediment in site drainage water and sedimentation of downstream waterways.

A drainage plan will be implemented for the project site, and it is described in detail in the EAR Surface Water and Mine Water Management Section. The drainage plan includes diverting runoff from undisturbed areas away from areas

disturbed by mining activities, collecting drainage from disturbed areas and directing it to sediment control structures for the control of suspended sediment prior to overflow from site.

An Erosion and Sediment Control Plan is in place for the Isaac Plains Mine, and this will be implemented for the project (discussed further in Section 8.2.5). The plan outlines methods and strategies to control soil erosion and minimise sediment transport.

7.4 Duration and timing of impacts

The duration and timing of the project's impacts has important effects on the magnitude of the overall impacts of the project.

Vegetation clearing for pit and infrastructure development is the principal direct impact from this project to vegetation communities and fauna habitat. The project is proposed to have a relatively short mine life of approximately 7 years. Clearing will take place progressively as pit development progresses. At completion of mining activities disturbed areas will be rehabilitated to a stable land form with a self-sustaining vegetation cover. Rehabilitation is discussed further in Section 8.2.3.

8 Mitigation

8.1 Measures to avoid impacts

The project has been designed to avoid impacts on terrestrial ecology as far as possible. The project mine plan does not include mining within the floodplains of the watercourses that traverse the project site. In particular, the mine has been designed to ensure that there will be no mining within the 0.1% Annual Exceedance Probability (AEP) (1 in 1,000 year) flood extents of Smoky Creek and Billy's Gully. This will avoid direct impacts on watercourses due to mining, and also allow the riparian vegetation habitat corridors to essentially remain intact.

The project will make use of the existing Isaac Plains Mine infrastructure, and only very limited new infrastructure is required to be constructed for the project. The proposed new infrastructure has been sited to avoid or minimise the clearing of remnant vegetation, where possible. In particular:

- The substation and reload pad on the project site have been sited to avoid the need for clearing of remnant vegetation.
- The haul road connections through the existing Isaac Plains ML have been sited to minimise the amount of remnant vegetation required to be cleared.

8.2 Measures to mitigate impacts

A range of plans and procedures are in place at the Isaac Plains Mine that are relevant to the management of terrestrial ecology. In particular, the Isaac Plains Mine has:

- a Permit to Disturb process, which is a process that is designed to ensure that environmental aspects (including potential impacts on terrestrial ecology) are considered as part of the vegetation clearing process
- procedures in relation to the rehabilitation of disturbed areas
- a Weed and Feral Animal Management Plan
- an Erosion and Sediment Control Plan.

The following sections outline key management measures relevant to the project, as detailed in the Isaac Plains Mine's existing plans and processes. These plans and procedures will be reviewed and revised, as necessary, prior to the commencement of the project to ensure that they address all project activities.

8.2.1 Permit to Disturb Process

Prior to the commencement of clearing activities, the area to be cleared will be assessed as part of the proponent's Permit to Disturb process. The assessment will include a description of the vegetation in the proposed clearance area (e.g. remnant vegetation, grazing pasture, riparian, etc.) based on existing mapping and an inspection of the area. The assessment will also include inspection of the area to be cleared to confirm whether any animal breeding places are present or

likely to be present. If breeding places are present or likely to be present, the proponent will engage a spotter catcher. The spotter catcher will:

- be appropriately qualified and experienced in wildlife management and will hold the necessary Rehabilitation Permit (under the *Nature Conservation (Administration) Regulation 2006*) to allow the removal of fauna from the area to be cleared, if necessary
- undertake a pre-clearing inspection of the area proposed to be cleared and relocate fauna, as necessary, during the pre-clearance inspection
- be present during clearing activities to provide advice in the event of native fauna being injured during clearing
- provide advice in relation to the direction in which trees should be felled and how trees with hollows are to be handled (e.g. whether there is a need for any felled trees to be left in situ to allow fauna to relocate).

The existing Permit to Disturb process also involves delineating the approved clearing area with survey pegs or flagging tape. This will ensure that any areas of remnant vegetation to be cleared are restricted to the minimum area necessary for mining operations and prevent unnecessary encroachment of disturbance into adjoining remnant vegetation.

8.2.2 Construction in watercourses

As noted in Section 8.1, there will be no mining within the 1 in 1,000 year flood extents of the watercourses traversing the project site. The only construction required in watercourses is the construction of two haul road crossings. The following management measures will be applied, in addition to the Permit to Disturb process, to minimise the impacts associated with the construction of the haul road crossings:

- undertaking construction of crossings during periods when the watercourses are dry
- implementing appropriate erosion and sediment control works, as necessary to prevent downstream sedimentation. This will be conducted in accordance with the requirements of the existing Isaac Plains Mine Erosion and Sediment Control Plan (which will be updated to include project activities), and the DNRM guideline *Activities in a Watercourse, Lake or Spring Associated with a Resource Activity or Mining Operatons* (as per the Isaac Plains Mine EA)
- stabilisation and/or revegetation of the final construction batters and embankments to minimise erosion
- any necessary revegetation of riparian areas or construction batters will be undertaken using native flora species.

8.2.3 Mine rehabilitation

In accordance with the Isaac Plains Mine EA, all areas disturbed by mining activities will be rehabilitated to a stable landform with a self-sustaining vegetation cover. Rehabilitation will be completed progressively. Rehabilitation design is based on achieving either bushland or grazing land uses. The Isaac Plains Mine EA includes requirements in relation to acceptance criteria for

rehabilitation. It requires that rehabilitation monitoring is undertaken on a yearly basis, including monitoring of reference sites (i.e. monitoring sites located in areas not subject to disturbance and which form a benchmark against which the success of rehabilitation can be measured).

8.2.4 Weed and feral animal management

The Isaac Plains Mine has a Weed and Feral Animal Management Plan in place, which describes the measures undertaken at the Isaac Plains Mine to manage weeds and feral animals as per the requirements of the Isaac Plains Mine EA and in accordance with the *Biosecurity Act*. This management plan will be updated to include the project.

The existing weed and pest control measures include the following measures that will also be applied to the project site:

- delivering education and awareness training about weeds and pest animals to all staff and contractors via site inductions
- implementing the following prevention measures:
  - use of wash down facilities by all vehicles and plant prior to entering the site and prior to exiting the mining area if they have been operating off graded site roads
  - maintenance of roads and tracks to minimise weeds on tracks and to reduce the spread of weeds by vehicle movements
  - monitoring topsoil stockpiles to ensure that they do not become infested with weeds.
- designing and implementing appropriate treatment control programs for priority weed species identified at the project site. The control programs will aim to contain and reduce the extent of weed species and prevent the introduction of additional species. Control programs may involve chemical and mechanical methods, depending on the sensitivity of the receiving environment
- undertaking weed audits and mapping throughout the project site for restricted pest species listed under the *Biosecurity Act* and those considered WONS. This mapping will identify any areas of severe weed infestation to allow prioritisation of weed management actions
- monitoring weed infestations, using photo point monitoring where necessary
- developing pest management strategies in consultation with relevant key stakeholders, such as local government
- passive monitoring of pest animals on the project site and implementing control options when population sizes are considered to require management.

8.2.5 Soil erosion and sedimentation

The conceptual drainage plan for the project site is described in detail in the EAR Surface Water and Mine Water Management Section. The drainage plan includes diverting runoff from undisturbed areas away from areas disturbed by mining activities, collecting drainage from disturbed areas and directing it to sediment

control structures for the control of suspended sediment prior to overflow from site.

The Isaac Plains Mine has an Erosion and Sediment Control Plan in place, which will be updated to include project activities. The plan outlines methods and strategies to control soil erosion and minimise sediment transport. Further detail on the plan is provided in the EAR Surface Water and Mine Water Management Section.

9 Residual impacts and offset liability

9.1 Introduction

Biodiversity offsets are required to compensate for significant residual impacts on MNES and MSES.

Offsets are required under the EPBC Act if an action is likely to give rise to a significant residual impact on MNES. The EPBC Act Environmental Offsets Policy (SEWPaC 2012) details requirements under the EPBC Act in relation to biodiversity offsets. The Significant Impact Guidelines 1.1: Matters of National Environmental Significance (DotE 2013) provides guidance to assist with determining whether an impact is considered significant. For some species, there are also species-specific guidelines available to assist with determining whether an impact is considered to be significant (e.g. EPBC Act referral guidelines for the vulnerable Koala (DotE 2014)).

In Queensland, offsets are required under the EO Act for activities likely to cause a significant residual impact on MSES, as defined in Schedule 2 of the EO Regulation. The SRI Guideline (EHP 2014a) is used to assess the potential for significant residual impacts to occur.

In the case of matters that are prescribed as being both MNES and MSES, offsets are not required under the Queensland EO Act if the same, or substantially the same, impact to the prescribed matter has been assessed under the EPBC Act.

Sections 9.2 and 9.3 outline potential significant residual impacts to MNES and MSES, respectively. These sections provide areas of impact from which offset liability may be determined. It should be noted that in many cases area calculations may overlap where an area supports more than one MNES or MSES. The areas quoted in the following sections cannot, therefore, be added.

Matters which are dual listed as both MNES and MSES are only discussed in Section 9.2, given that offsets under the EPBC Act take precedence.

9.2 Matters of national environmental significance

The Assessments of Significance provided in Appendix P describe and assess the project's potential impacts on MNES. As detailed in Appendix P, for the Squatter Pigeon, Greater Glider and Koala, the assessment concluded that there will be no residual impact to these MNES, given that impacts could be avoided or minimised sufficiently to reduce the likelihood of the project giving rise to significant residual impacts. Similarly, the project is unlikely to have a significant residual impact on migratory species listed under the EPBC Act, given that the study area is unlikely to support important habitat for migratory species, and does not support an ecologically significant proportion of the population of these migratory species. Further detail is provided in Appendix P.

9.3 Matters of state environmental significance

Appendix Q assesses the MSES relevant to terrestrial ecology. This appendix:

- contains a list of MSES that occur within the project site that are likely to require offsets
- indicates whether the matters are also listed under the EPBC Act, given that matters also classified as MNES do not require offsets under the EO Act
- summarises potential impacts on the MSES
- provides cross references to sections of this report that discuss the impacts
- concludes whether offsets are required under the EO Act. Reference has been made to the SRI Guideline in determining whether offsets are required.

As per the findings in Appendix Q, offsets are required for the following MSES:

- Regulated vegetation – of concern REs. Offsets are required for clearing:
  - 3.7 ha of RE 11.9.7a
- Watercourse REs. Offsets are required for clearing:
  - 0.7 ha of RE 11.3.25

As detailed in Section 9.1, these areas cannot be added, given that an area of land may support multiple MSES. Offsets are proposed to be provided for these impacts.

The proponent is still considering options for the provision of offsets. They may be provided as land-based offsets, or alternatively as a financial settlement offset.

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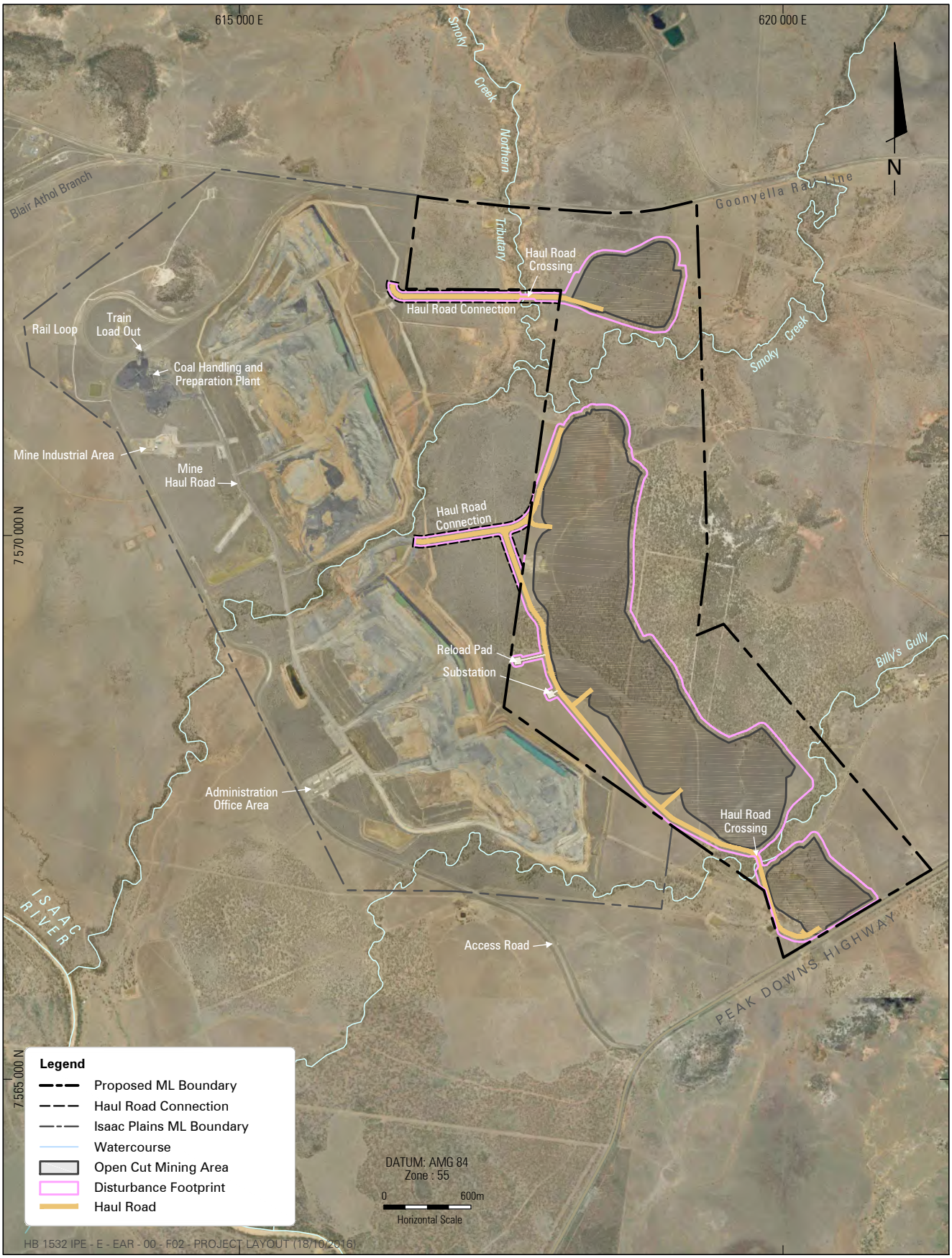
Figures

ISAAC PLAINS EAST PROJECT

stanmorecoal | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Project Location

FIGURE 1



ISAAC PLAINS EAST PROJECT

stanmorecoal | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Project Layout and Disturbance Footprint

FIGURE 2

ISAAC PLAINS EAST PROJECT

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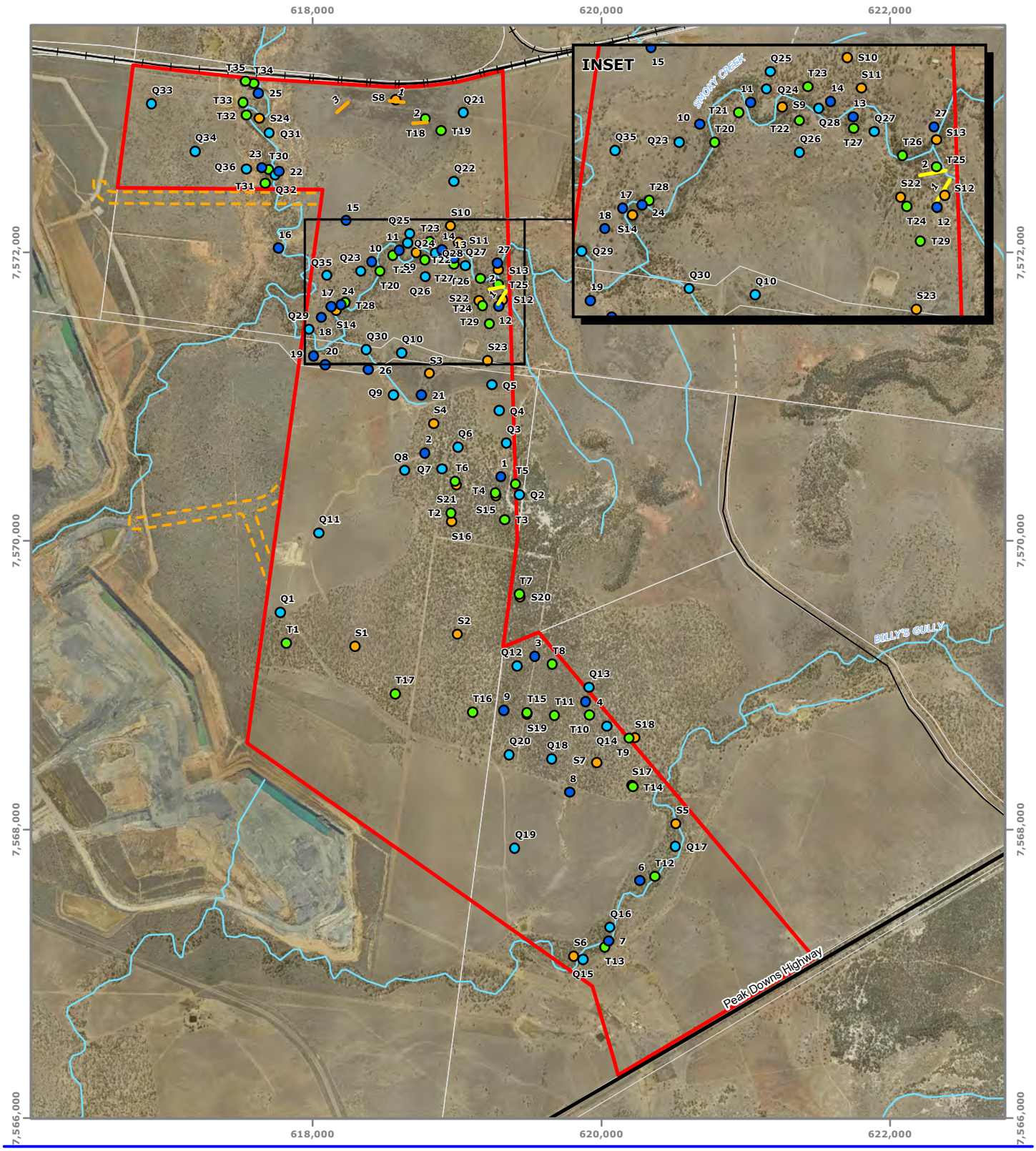
Project Setting

FIGURE 3



Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Vegetation Assessment Sites

- Secondary Assessment Site
- Tertiary Assessment Site
- Quaternary Assessment Site
- Quaternary Assessment Site (Photo Point)
- Brigalow survey transects
- Natural Grassland survey transects

Figure 4 : Flora survey sites in the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_04_D
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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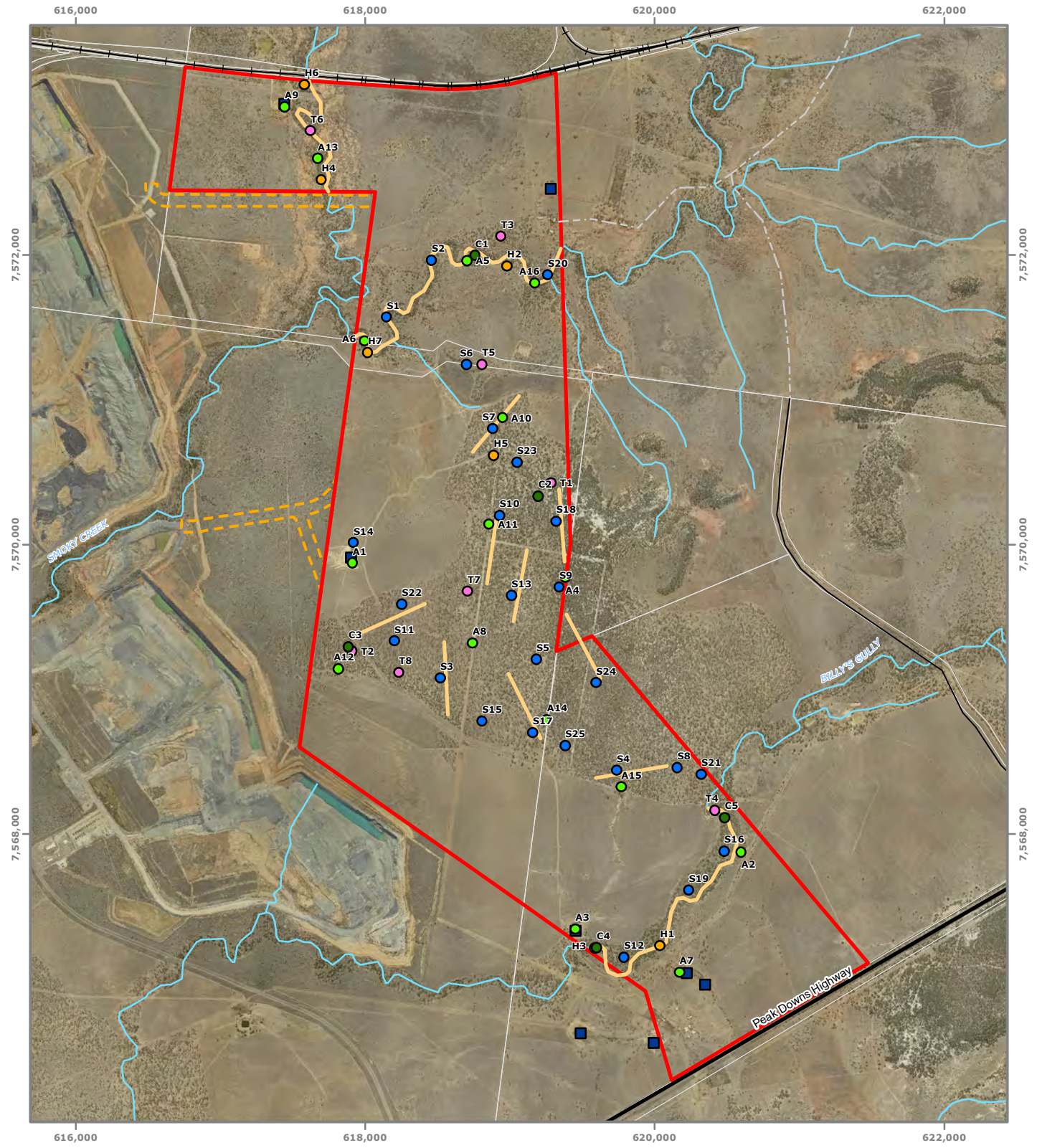

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Water Source

- Water Point

Fauna Survey Sites

- Anabat Site
- Harp Trap Site
- Supplementary Survey Site
- Trap Site
- Camera Trap Site
- Koala Transect

Figure 5 : Fauna survey sites in the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_05_C
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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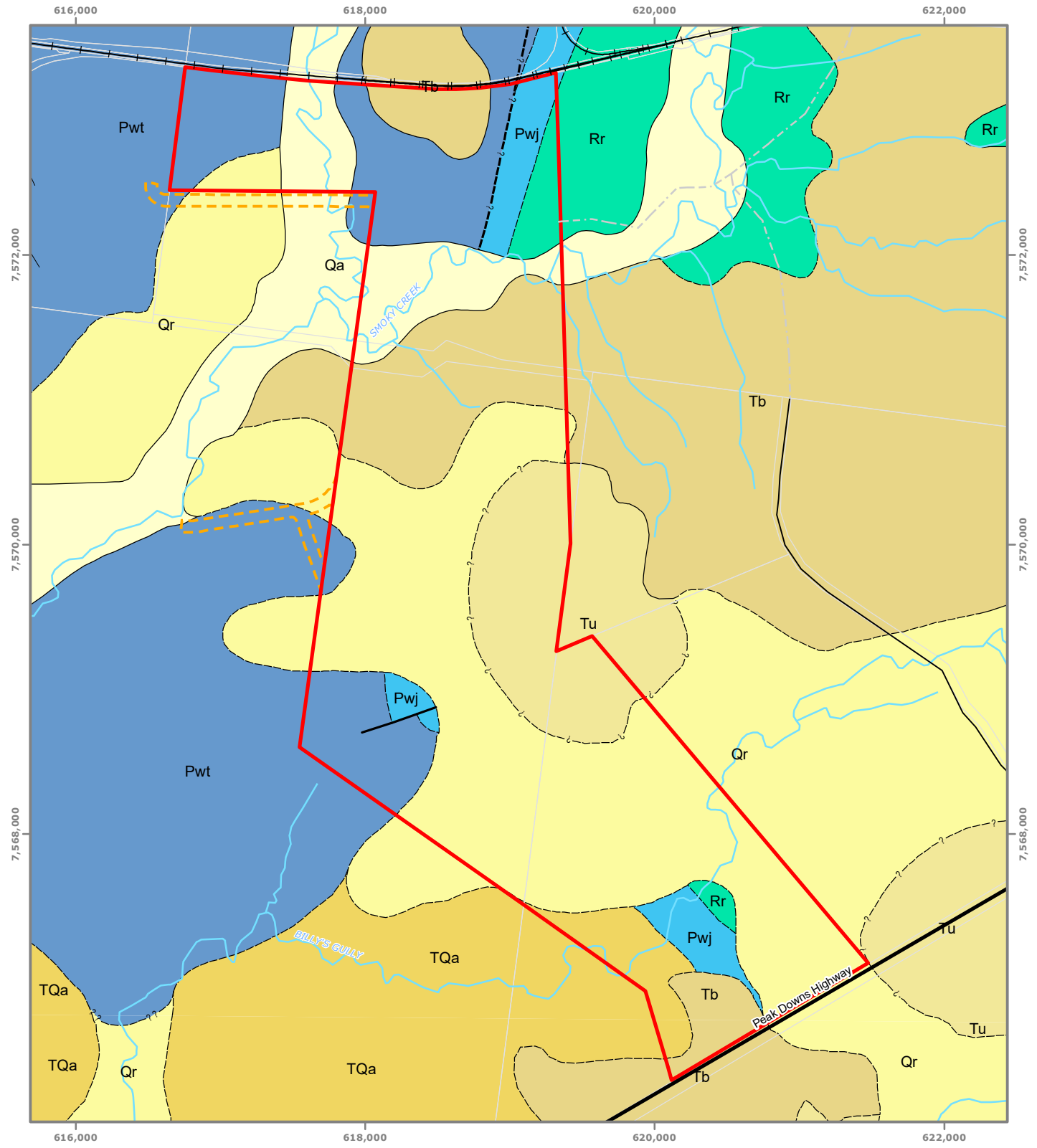

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse

Rock Unit Name (Map Symbol)	Lithology	Dominant Rock	Age
Qa-QLD (Qa)	Clay, silt, sand, gravel; flood-plain alluvium	ALLV	QUATERNARY
Qr-QLD (Qr)	Clay, silt, sand, gravel and soil; colluvial and residual deposits	COLLUVIUM	QUATERNARY
TQa-QLD (TQa)	Locally red-brown mottled, poorly consolidated sand, silt, clay, minor gravel; high-level alluvial deposits, generally dissected, and related to present stream valleys	PCON	LATE TERTIARY - QUATERNARY
Suttor Formation (Tu)	Quartz sandstone, clayey sandstone, mudstone and conglomerate; fluvial and lacustrine sediments; minor interbedded basalt	SEDS	TERTIARY
Tb-QLD (Tb)	Mostly olivine basalt flows and some plugs; some areas of nephelinite, basanite etc	BSLT	TERTIARY
Rewan Group (Rr)	Lithic sandstone, pebbly lithic sandstone, green to reddish brown mudstone and minor volcanilithic pebble conglomerate (at base)	ARMU	EARLY TRIASSIC
Fort Cooper Coal Measures (Pwt)	Lithic sandstone, conglomerate, mudstone, carbonaceous shale, coal, tuff, tuffaceous (cherty) mudstone	SEDS	LATE PERMIAN
Rangal Coal Measures (Pwj)	Calcareous sandstone, calcareous shale, mudstone, coal, concretionary limestone	ARMU	LATE PERMIAN

Figure 6 : Geology mapping for the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_06_F
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Data: DCDB, Roads, Railway, Watercourse, Geology - (c)DNRM 2016

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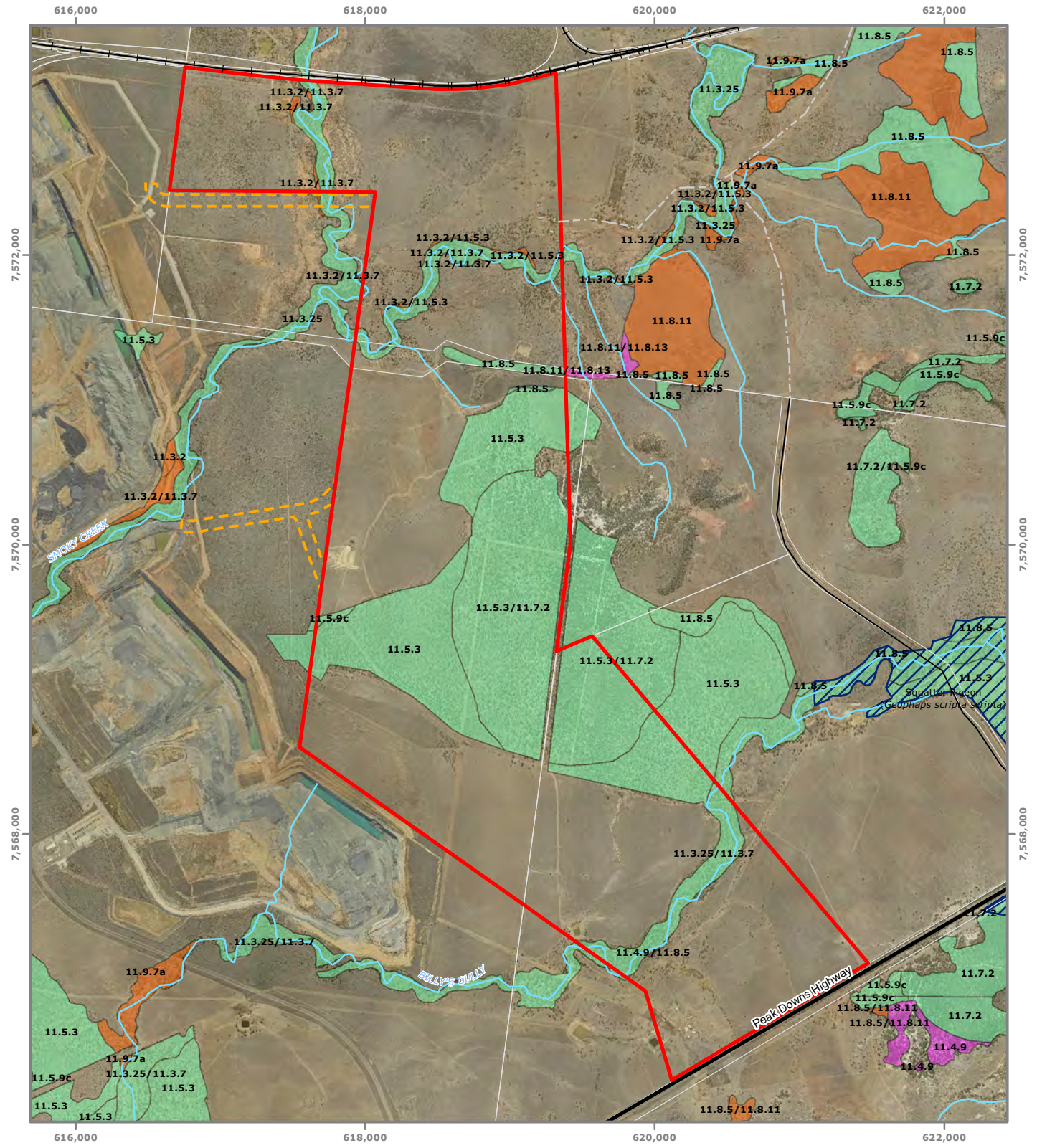

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary
- VMA Essential Habitat V4.27

Vegetation Management Act Status

- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystems

Figure 7 : Queensland Government regional ecosystem mapping for the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_07_F
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse, Regional Ecosystems - (c)DNRM 2016

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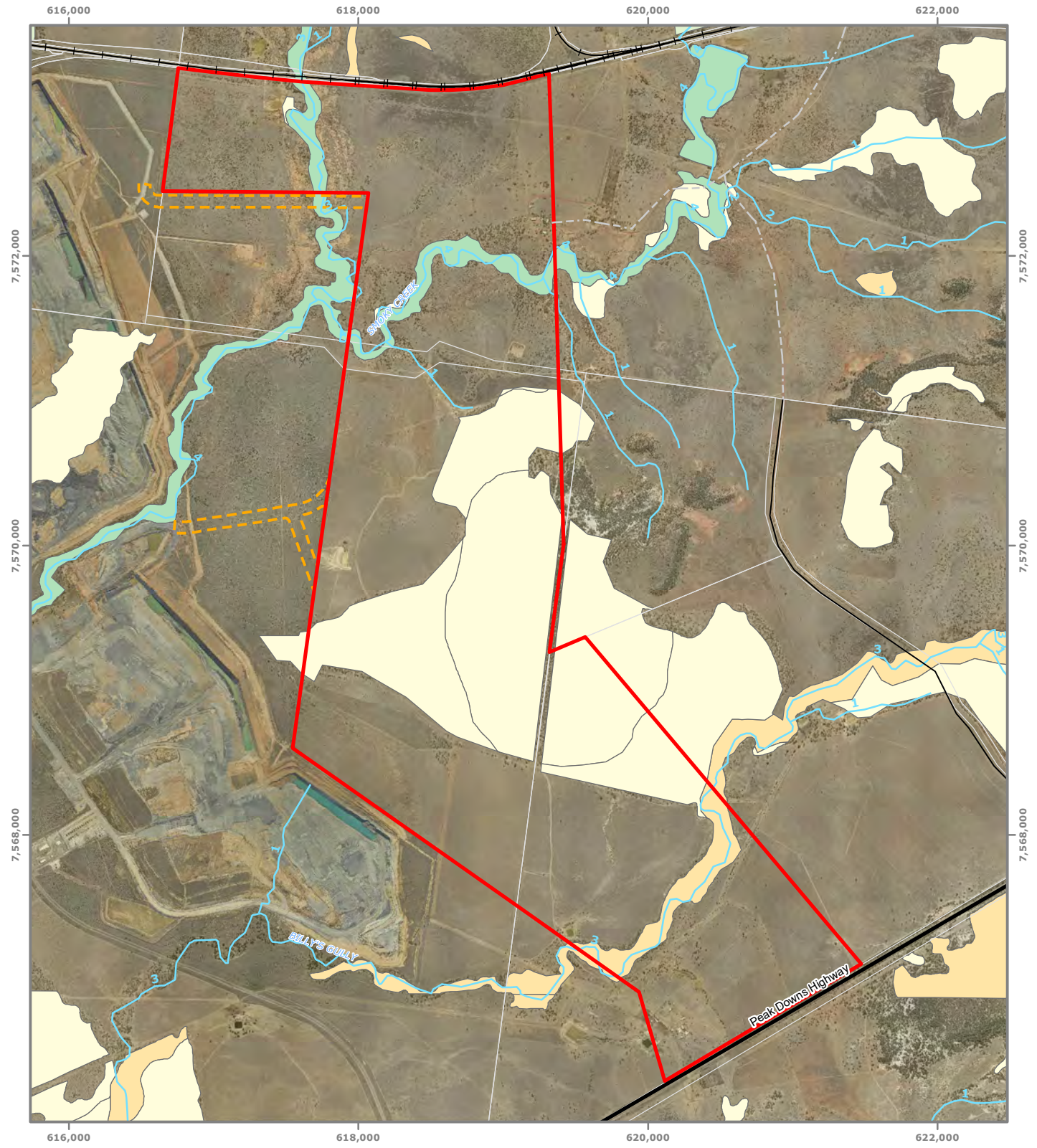

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

GDE, Reliant on surface expression of groundwater (rivers, springs, wetlands)

- High potential for groundwater interaction
- Moderate potential for groundwater interaction

GDE, Reliant on subsurface groundwater (vegetation)

- Moderate potential for groundwater interaction
- Low potential for groundwater interaction

Figure 8 : Bureau of Meteorology Groundwater Dependent Ecosystem mapping for the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_08_F
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016
GDE Atlas - (c)BOM 2016

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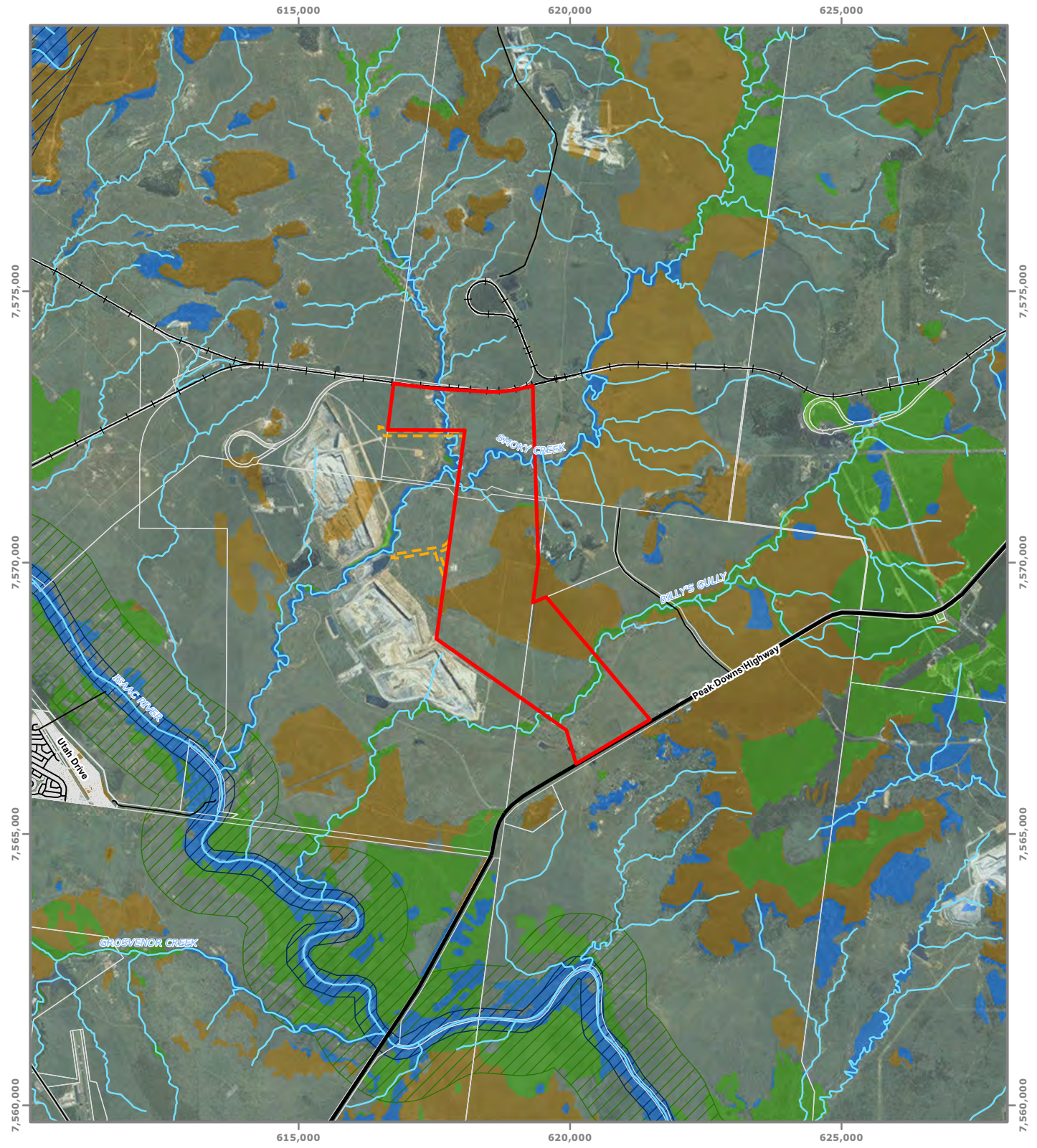

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Biodiversity Planning Assessment Mapping

Ecological Corridors

- State
- Regional

Biodiversity Significance

- State
- Regional
- Local or Other Values

Figure 9 : Biodiversity Planning Assessment mapping for the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_09_F
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Digital Globe - August 2010
Data: DCDB, Roads, Railway, Watercourse, BPA - (c)DNRM 2016

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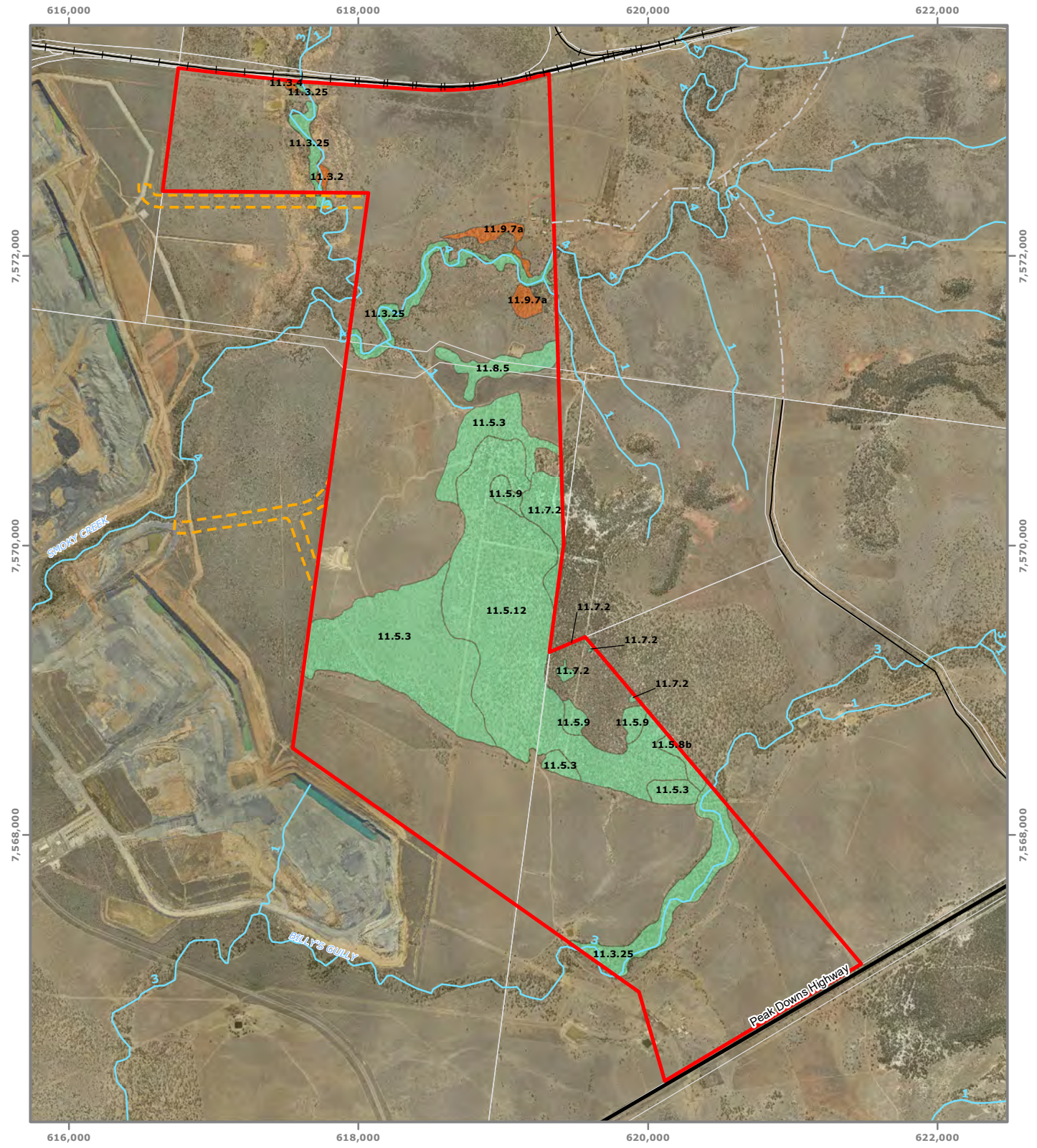

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Remnant Vegetation

Vegetation Management Act Status

- Of concern
- Least concern

Figure 10 : Field-validated regional ecosystem mapping for the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_10_G
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Recorded Locations

- *Bertya pedicellata* (no common name) – Near threatened (NC Act)

Figure 11 : *Bertya pedicellata* records for the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_11_G
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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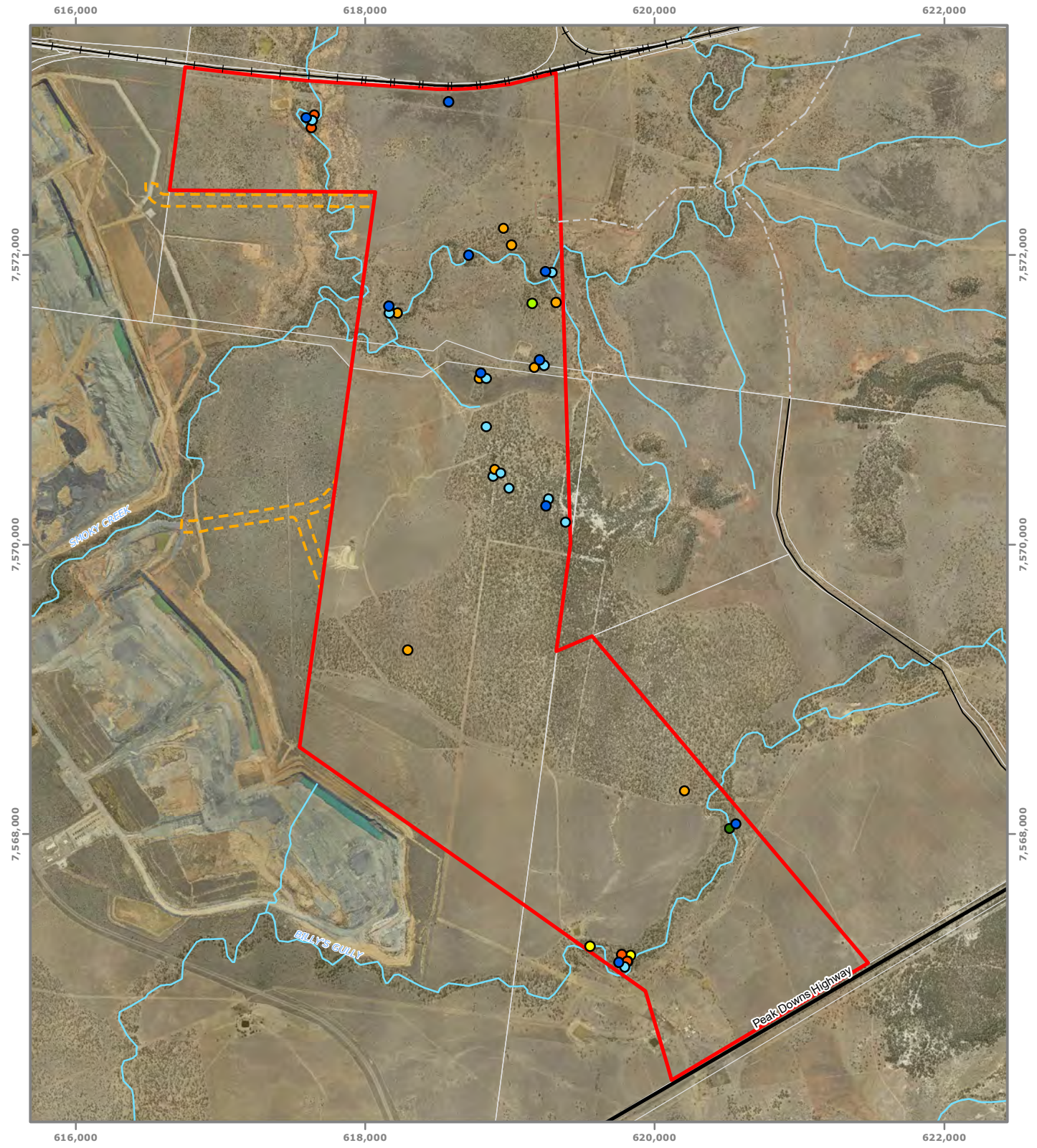

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Individual and plot based records of weeds

- Rubber Vine (*Cryptostegia grandiflora*) – Category 3 (Biosecurity Act), WoNS
- Harrisia Cactus (*Harrisia martinii*) – Category 3 (Biosecurity Act)
- Bellyache Bush (*Jatropha gossypiifolia*) – Category 3 (Biosecurity Act), WoNS
- Tiger Pear (*Opuntia aurantiaca*) – Category 3 (Biosecurity Act), WoNS
- Common Prickly Pear (*Opuntia stricta*) – Category 3 (Biosecurity Act), WoNS
- Velvety Tree Pear (*Opuntia tomentosa*) – Category 3 (Biosecurity Act), WoNS
- Parthenium Weed (*Parthenium hysterophorus*) – Category 3 (Biosecurity Act), WoNS

Figure 12 : Notable weeds identified in the project site

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_12_G
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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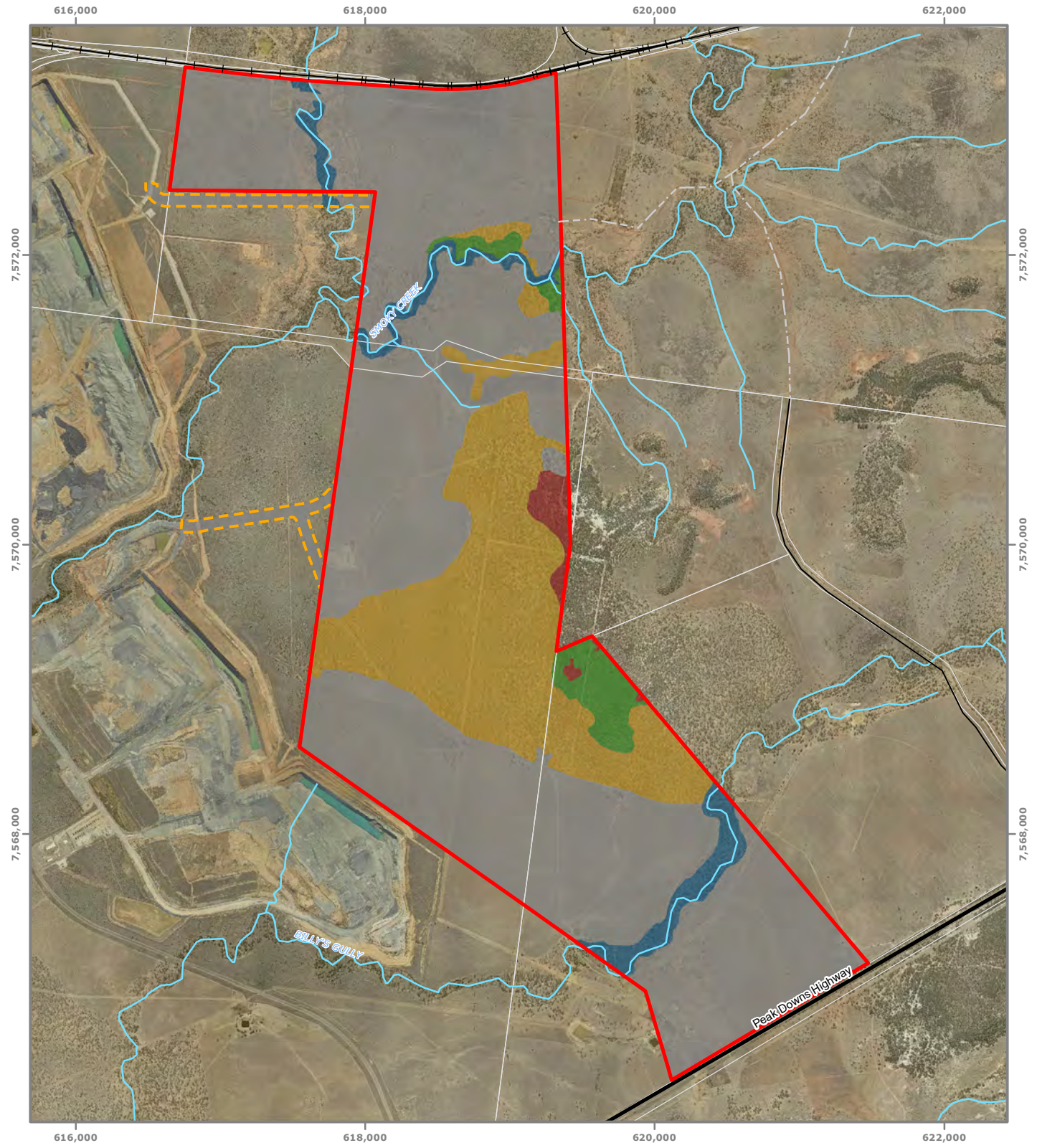

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Broad Habitat Types

- Riparian vegetation
- Woodlands and open woodlands
- Lancewood with emergent gums
- Regenerating shrubby woodland with emergent gums
- Cleared and disturbed areas

Figure 13 : Broad habitat types in the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_13_G
Date: 30 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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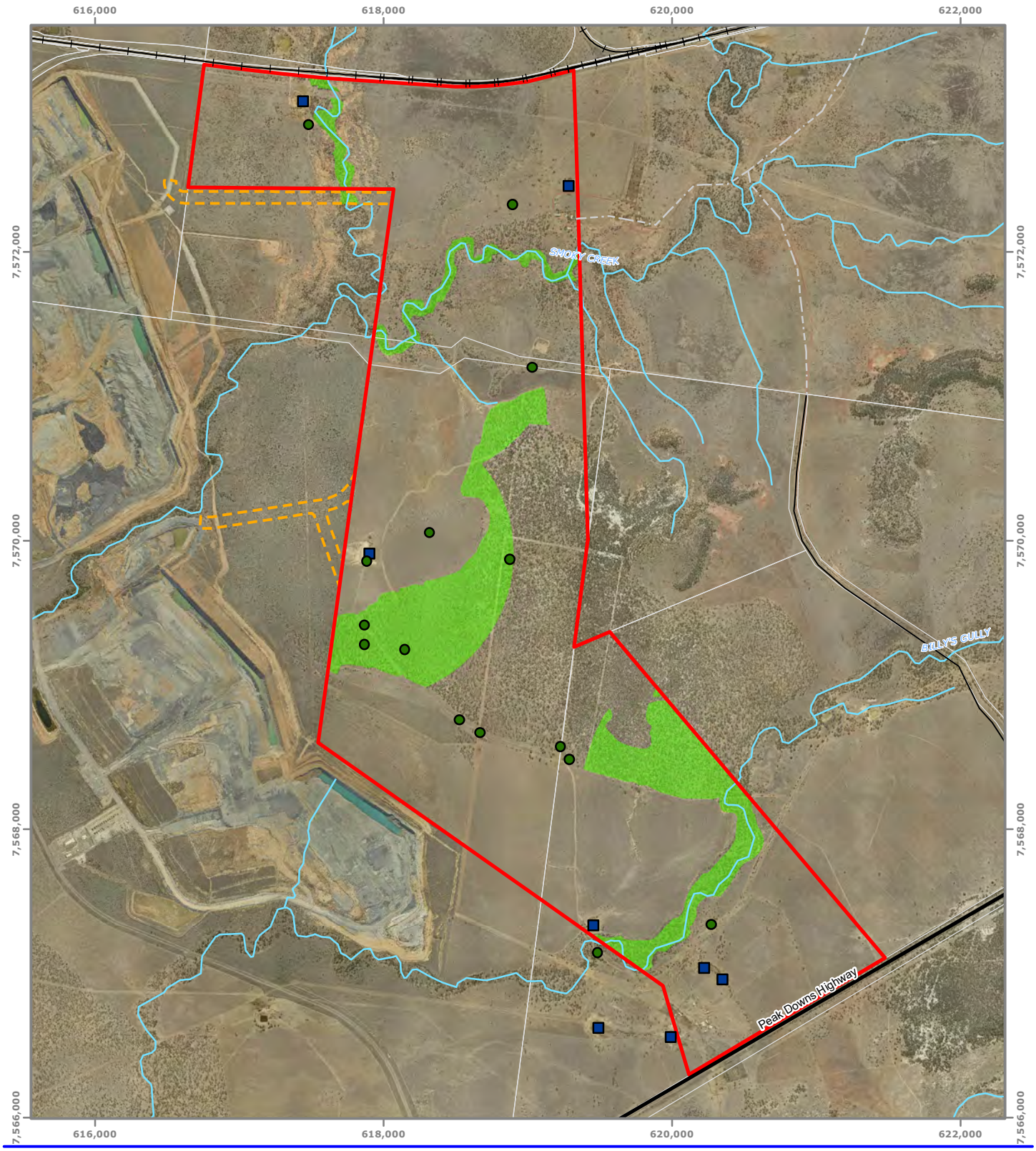

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Water Source

- Water Point

Recorded Locations

- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable (EPBC Act and NC Act)

Habitat Mapping

- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable (EPBC Act and NC Act)

Figure 14 : Squatter Pigeon records and potential habitat within the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_14_G
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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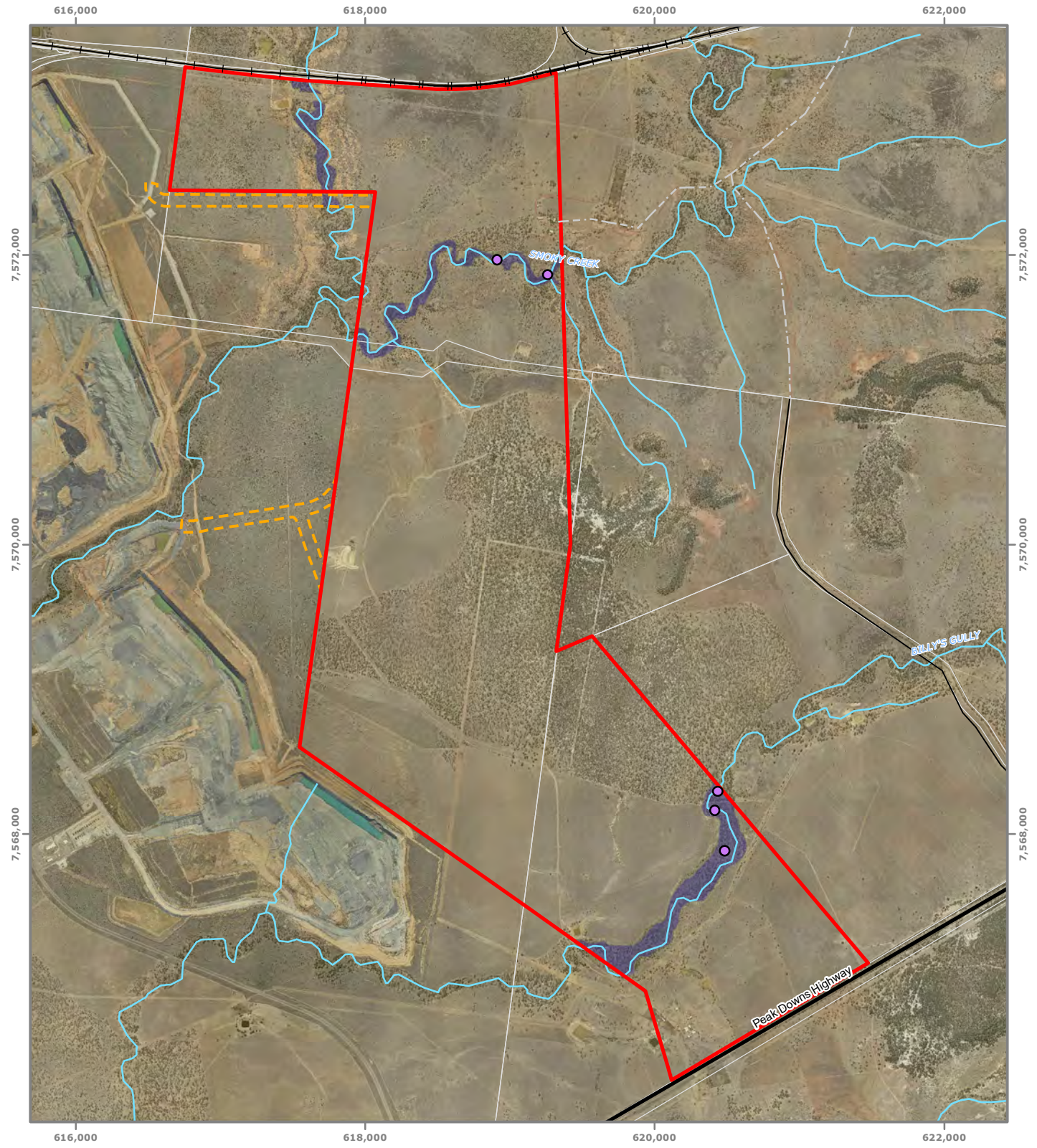

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Recorded Locations

- Greater Glider (*Petauroides volans*) – Vulnerable (EPBC Act)

Habitat Mapping

- Greater Glider (*Petauroides volans*) – Vulnerable (EPBC Act)

Figure 15 : Greater Glider records and potential habitat within the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_15_E
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway - (c)DNRM 2016

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Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Recorded Locations

- Ornamental Snake (*Denisonia maculata*) – Vulnerable (EPBC Act and NC Act)

Figure 16 : Ornamental Snake record for the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_16_G
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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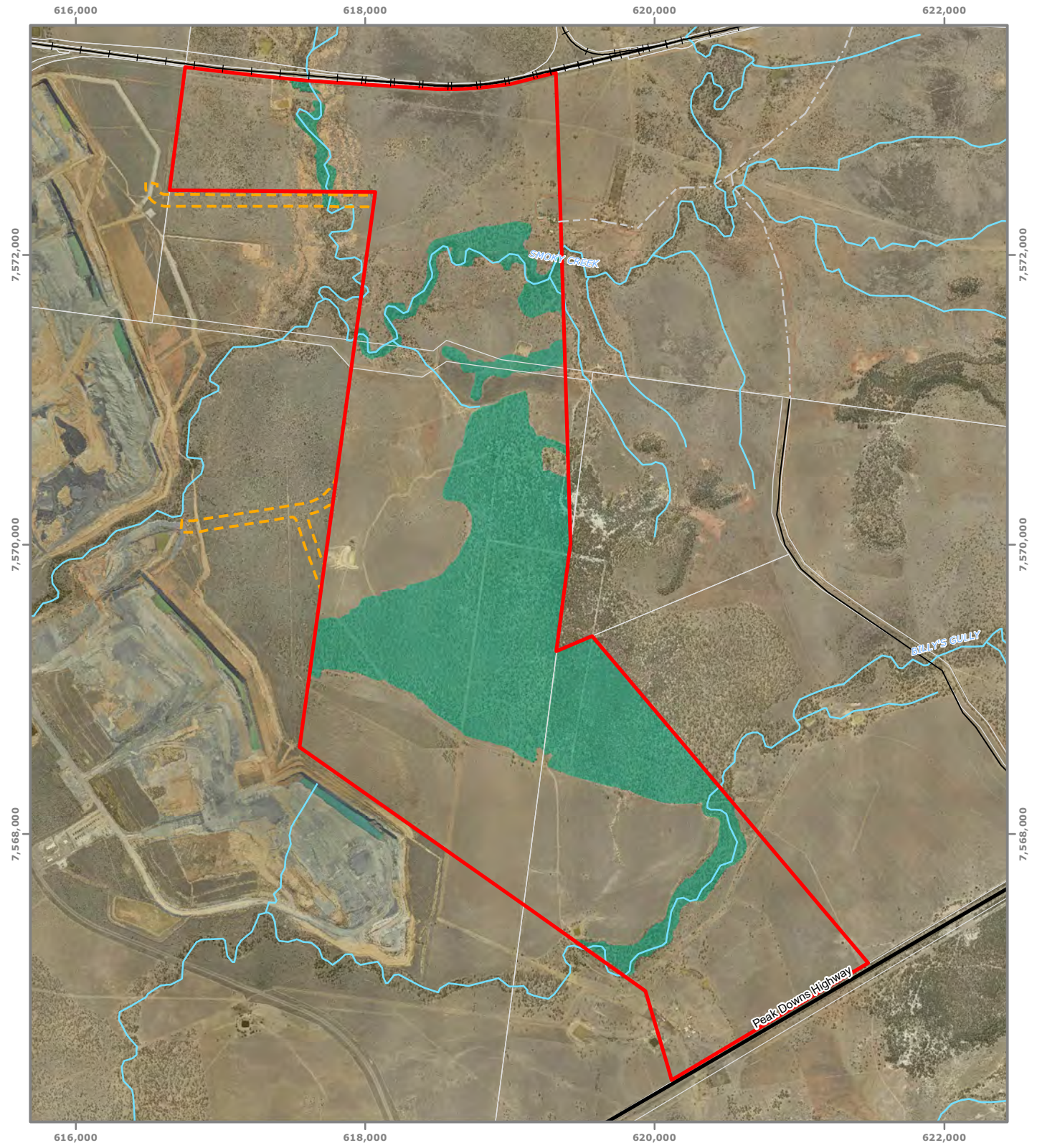

Legend

- Project Site
- Proposed Haul Road Connections
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Potential Habitat Mapping

- Koala (*Phascolarctos cinereus*) – Vulnerable (EPBC Act and NC Act)

Figure 17 : Potential Koala habitat within the ecology study area

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_17_E
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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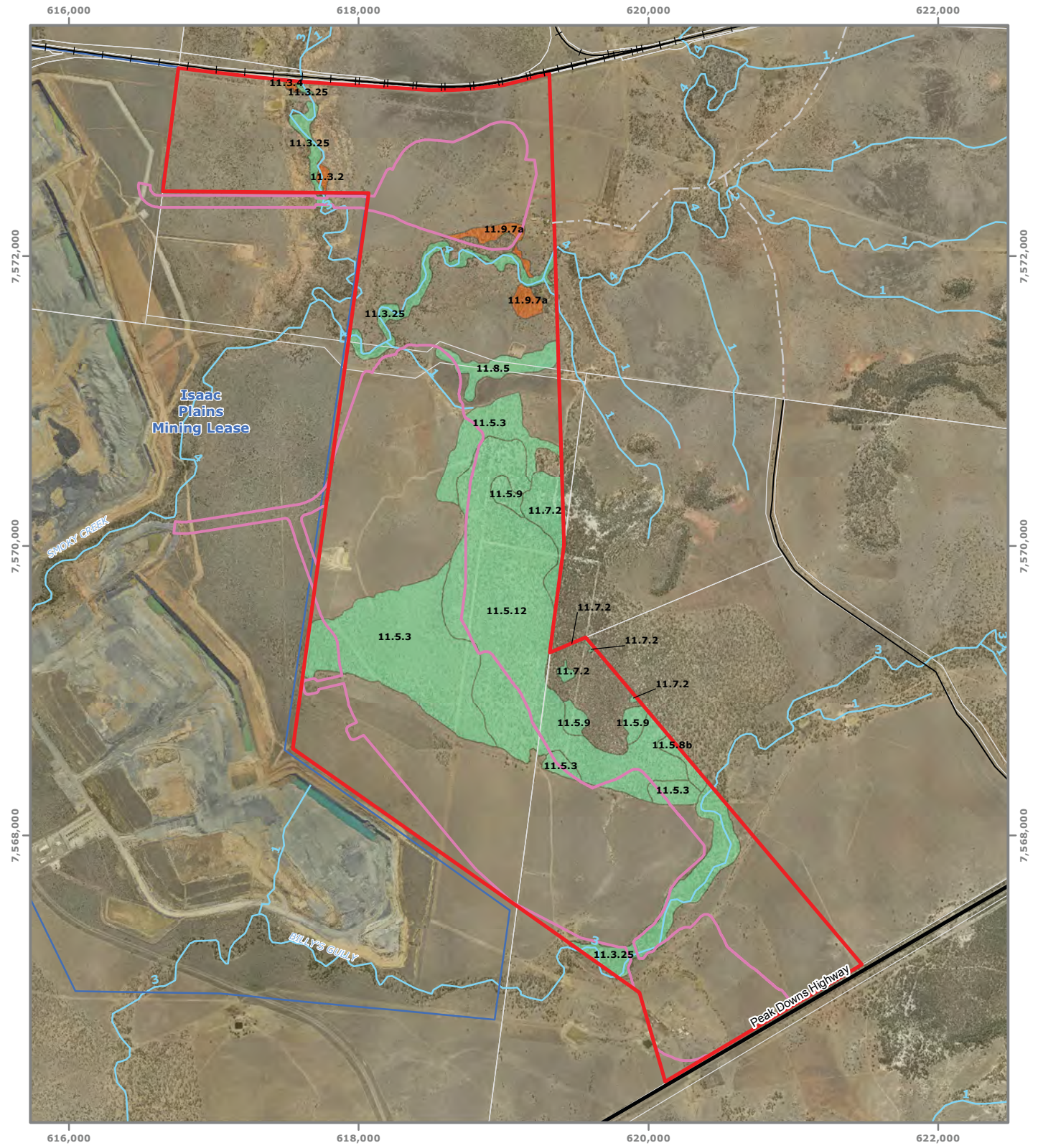

Legend

- Project Site
- Disturbance Footprint
- Isaac Plains Mining Lease
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Remnant Vegetation

Vegetation Management Act Status

- Of concern
- Least concern

Figure 18 : Field-validated regional ecosystems proposed to be impacted by the project

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_18_F
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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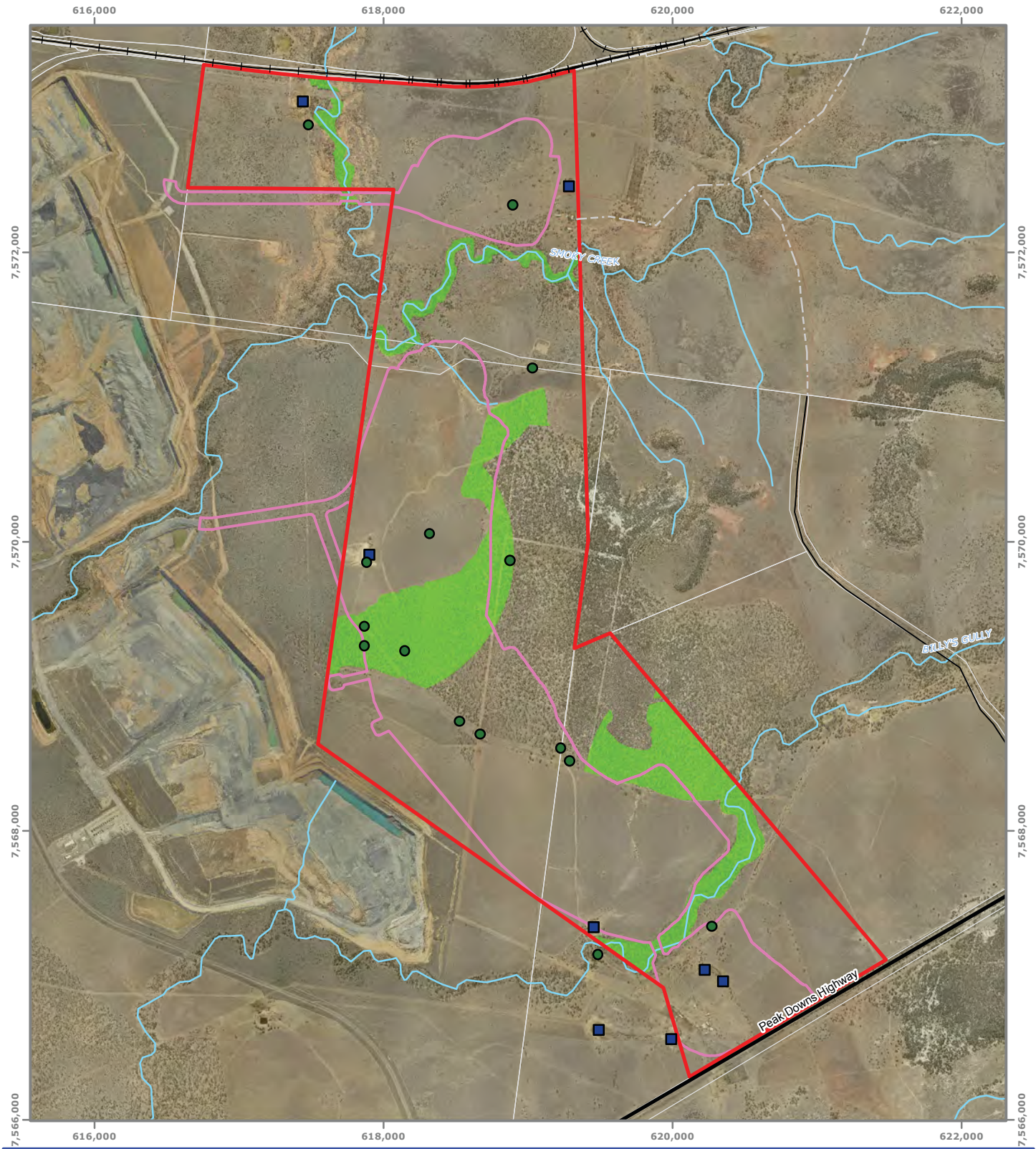

Legend

- Project Site
- Disturbance Footprint
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Water Source

- Water Point

Recorded Locations

- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable (EPBC Act and NC Act)

Habitat Mapping

- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable (EPBC Act and NC Act)

Figure 19 : Squatter Pigeon habitat proposed to be impacted by the project

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_19_F
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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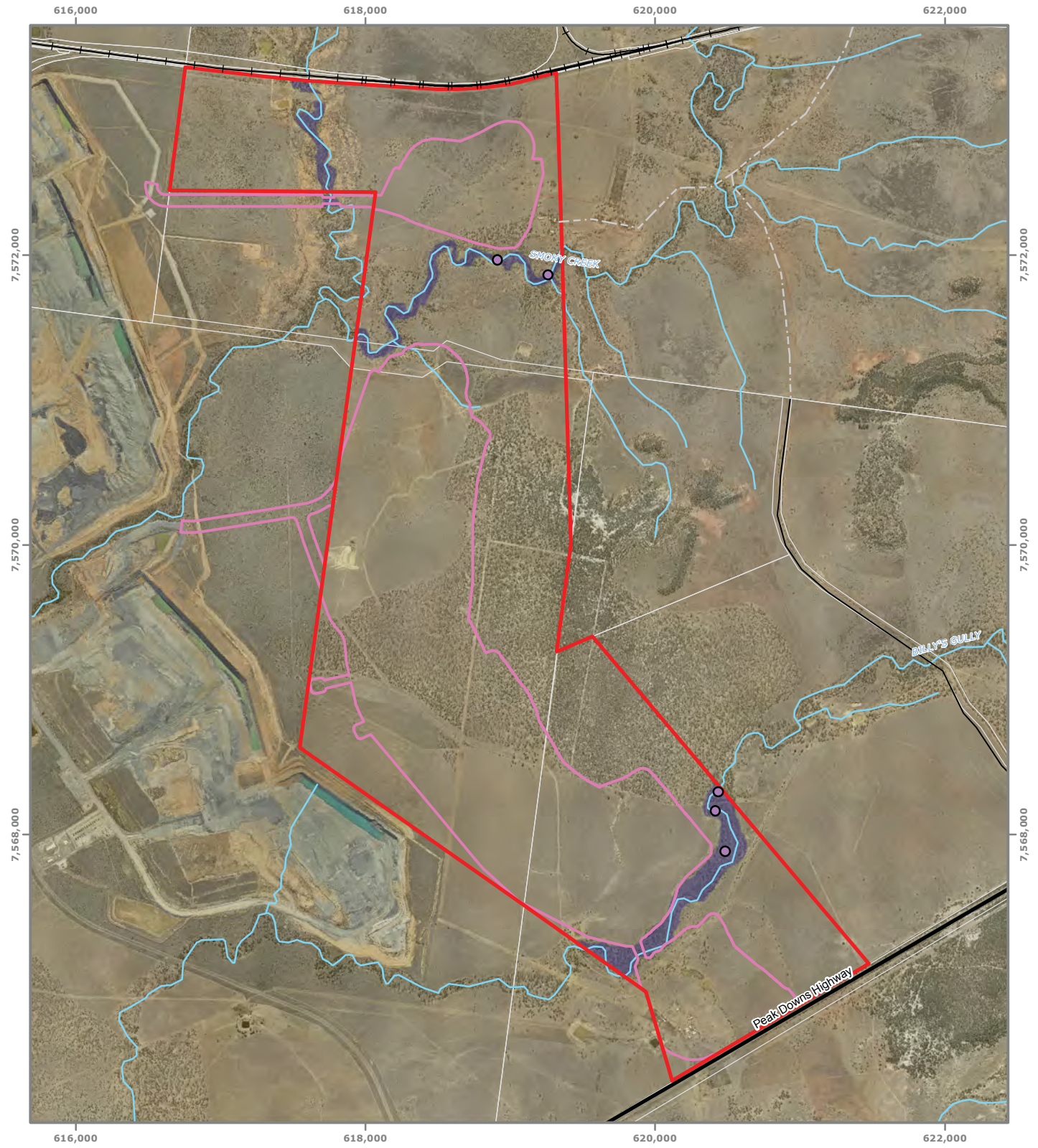

Legend

- Project Site
- Disturbance Footprint
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Recorded Locations

- Greater Glider (*Petauroides volans*) – Vulnerable (EPBC Act)

Habitat Mapping

- Greater Glider (*Petauroides volans*) – Vulnerable (EPBC Act)

Figure 20 : Greater Glider habitat proposed to be impacted by the project

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_20_C
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway - (c)DNRM 2016

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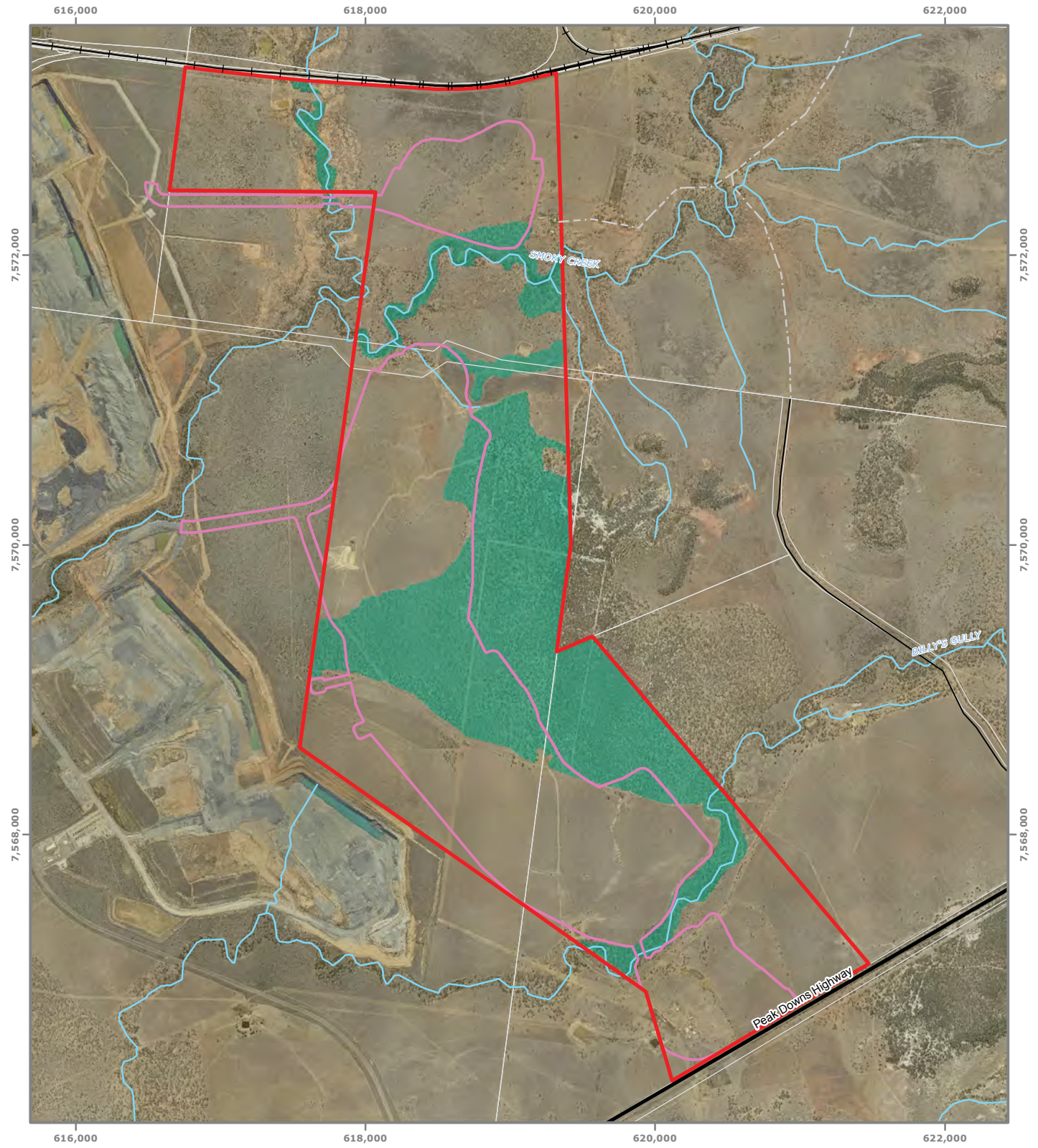

Legend

- Project Site
- Disturbance Footprint
- Highway
- Local Road
- Vehicular Track
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Potential Habitat Mapping

- Koala (*Phascolarctos cinereus*) – Vulnerable (EPBC Act and NC Act)

Figure 21 : Potential Koala habitat proposed to be impacted by the project

Isaac Plains East Project
Terrestrial Ecology Assessment

Map Number: 15046_EAR_21_B
Date: 29 August 2016
Map Projection: GDA 1994 MGA Zone 55
Imagery: Stanmore Coal - Sept 2015
Data: DCDB, Roads, Railway, Watercourse - (c)DNRM 2016

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Appendix A

EPBC Act Protected Matters Search Report

Australian Government
Department of the Environment and Energy

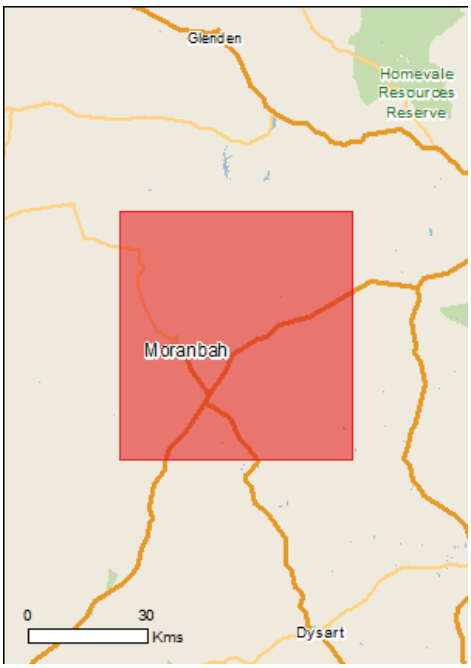
EPBC Act Protected Matters Report

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.

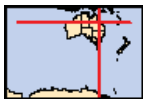
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 11/10/16 14:28:18



Coordinates
Buffer: 0.0Km



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 Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	22
Listed Migratory Species:	9

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. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

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:	15
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.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	19
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered	Community likely to occur within area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [331]	Endangered	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to 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 known to occur within area
Other		
Cycas ophiolitica [55797]	Endangered	Species or species habitat likely to occur within area
Plants		
Dichanthium queenslandicum King Blue-grass [5481]	Endangered	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus raveretiana Black Ironbox [16344]	Vulnerable	Species or species habitat likely to occur within area
Samadera bidwillii [29708]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat known to occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Elseya albagula Southern Snapping Turtle, White-throated Snapping Turtle [81648]	Critically Endangered	Species or species habitat likely to occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area
Lerista allanae Allan's Lerista, Retro Slider [1378]	Endangered	Species or species habitat may occur within area
Rheodytes leukops Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Vulnerable	Species or species habitat may occur within 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		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		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 known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		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 likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

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
Birds		
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		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		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
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
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Vachellia nilotica Prickly Acacia, Blackthorn, Prickly Mimosa, Black Piquant, Babul [84351]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

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 and National Heritage properties, Wetlands of International and National 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.

Coordinates

-21.71492 147.89652,-21.71492 148.41903,-22.22927 148.41903,-22.22927 147.89652,-21.71492 147.89652

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:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian 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
Forestry Corporation, 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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Appendix B

Queensland Wildlife Online Database search results

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Defined Area
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: 21.7149 to 22.2293
Longitude: 147.8965 to 148.4190
Email: meredith.watherston@ecosm.com.au
Date submitted: Wednesday 06 Jul 2016 14:13:10
Date extracted: Wednesday 06 Jul 2016 14:20:02

The number of records retrieved = 672

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			21
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		10
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		47
animals	amphibians	Hylidae	*Cyclorana brevipes*	superb collared frog		C		1
animals	amphibians	Hylidae	*Cyclorana verrucosa*	rough collared frog		C		2/1
animals	amphibians	Hylidae	*Litoria latopalmata*	broad palmed rocketfrog		C		3
animals	amphibians	Hylidae	*Cyclorana alboguttata*	greenstripe frog		C		7
animals	amphibians	Hylidae	*Cyclorana novaehollandiae*	eastern snapping frog		C		17
animals	amphibians	Hylidae	*Litoria rothii*	northern laughing treefrog		C		1
animals	amphibians	Hylidae	*Litoria inermis*	bumpy rocketfrog		C		4
animals	amphibians	Limnodynastidae	*Limnodynastes salmini*	salmon striped frog		C		5
animals	amphibians	Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		C		23
animals	amphibians	Limnodynastidae	*Limnodynastes tasmaniensis*	spotted grassfrog		C		10
animals	amphibians	Limnodynastidae	*Limnodynastes terraereginae*	scarlet sided pobblebonk		C		3
animals	amphibians	Myobatrachidae	*Uperoleia sp.*					1
animals	birds	Acanthizidae	*Acanthiza nana*	yellow thornbill		C		2
animals	birds	Acanthizidae	*Gerygone olivacea*	white-throated gerygone		C		26
animals	birds	Acanthizidae	*Acanthiza apicalis*	inland thornbill		C		3
animals	birds	Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		C		6
animals	birds	Acanthizidae	*Sericornis frontalis*	white-browed scrubwren		C		2
animals	birds	Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		C		2
animals	birds	Acanthizidae	*Chthonicola sagittata*	speckled warbler		C		7
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		57
animals	birds	Accipitridae	*Accipiter cirrocephalus*	collared sparrowhawk		C		2
animals	birds	Accipitridae	*Hieraaetus morphnoides*	little eagle		C		1
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		14
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk		C		2
animals	birds	Accipitridae	*Elanus axillaris*	black-shouldered kite		C		2
animals	birds	Accipitridae	*Circus assimilis*	spotted harrier		C		1
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		9
animals	birds	Accipitridae	*Milvus migrans*	black kite		C		5
animals	birds	Acrocephalidae	*Acrocephalus australis*	Australian reed-warbler		SL		1
animals	birds	Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		C		4
animals	birds	Alaudidae	*Mirafra javanica*	Horsfield's bushlark		C		3
animals	birds	Anatidae	*Aythya australis*	hardhead		C		3
animals	birds	Anatidae	*Cygnus atratus*	black swan		C		3
animals	birds	Anatidae	*Malacorhynchus membranaceus*	pink-eared duck		C		1
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		11
animals	birds	Anatidae	*Dendrocygna eytoni*	plumed whistling-duck		C		3
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		12
animals	birds	Anatidae	*Nettapus coromandelianus*	cotton pygmy-goose		C		2
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		10
animals	birds	Anhingidae	*Anhinga novaehollandiae*	Australasian darter		C		9
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		14
animals	birds	Ardeidae	*Nycticorax caledonicus*	nankeen night-heron		C		1
animals	birds	Ardeidae	*Ardea alba modesta*	eastern great egret		SL		4

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		3
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		10
animals	birds	Ardeidae	*Ardea ibis*	cattle egret		SL		2
animals	birds	Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		C		5
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		36
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		26
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		55
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		6
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		55
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		3
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		27
animals	birds	Cacatuidae	*Nymphicus hollandicus*	cockatiel		C		2
animals	birds	Cacatuidae	*Eolophus roseicapillus*	galah		C		24
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		28
animals	birds	Campephagidae	*Coracina tenuirostris*	cicadabird		C		18
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		C		3
animals	birds	Campephagidae	*Lalage tricolor*	white-winged triller		C		8
animals	birds	Campephagidae	*Coracina maxima*	ground cuckoo-shrike		C		2
animals	birds	Casuariidae	*Dromaius novaehollandiae*	emu		C		8
animals	birds	Charadriidae	*Vanellus miles miles*	masked lapwing (northern subspecies)		C		2
animals	birds	Charadriidae	*Elseyornis melanops*	black-fronted dotterel		C		7
animals	birds	Charadriidae	*Vanellus tricolor*	banded lapwing		C		1
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		6
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork		C		2
animals	birds	Cisticolidae	*Cisticola exilis*	golden-headed cisticola		C		3
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	19
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		22
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove		C		8
animals	birds	Columbidae	*Phaps chalcoptera*	common bronzewing		C		1
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		13
animals	birds	Coraciidae	*Eurystomus orientalis*	dollarbird		C		17
animals	birds	Corcoracidae	*Corcorax melanorhamphos*	white-winged chough		C		6
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		27
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		80
animals	birds	Corvidae	*Corvus bennetti*	little crow		C		1
animals	birds	Cuculidae	*Cacomantis flabelliformis*	fan-tailed cuckoo		C		3
animals	birds	Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo		C		6
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		4
animals	birds	Cuculidae	*Chalcites lucidus*	shining bronze-cuckoo		C		3
animals	birds	Cuculidae	*Cacomantis pallidus*	pallid cuckoo		C		6
animals	birds	Cuculidae	*Chalcites minutillus*	little bronze-cuckoo		C		3
animals	birds	Cuculidae	*Eudynamys orientalis*	eastern koel		C		5
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		14
animals	birds	Dicruridae	*Dicrurus bracteatus*	spangled drongo		C		4
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		3
animals	birds	Estrildidae	*Lonchura castaneothorax*	chestnut-breasted mannikin		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		16
animals	birds	Eurostopodidae	*Eurostopodus mystacalis*	white-throated nightjar		C		2
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		8
animals	birds	Falconidae	*Falco longipennis*	Australian hobby		C		3
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel		C		15
animals	birds	Gruidae	*Grus rubicunda*	brolga		C		10
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		5
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		8
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		9
animals	birds	Halcyonidae	*Todiramphus pyrrhopygius*	red-backed kingfisher		C		5
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		40
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		4
animals	birds	Hirundinidae	*Petrochelidon ariel*	fairy martin		C		6
animals	birds	Hirundinidae	*Hirundo neoxena*	welcome swallow		C		4
animals	birds	Jacanidae	*Irediparra gallinacea*	comb-crested jacana		C		2
animals	birds	Maluridae	*Malurus cyaneus*	superb fairy-wren		C		1
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		29
animals	birds	Maluridae	*Malurus lamberti*	variegated fairy-wren		C		17
animals	birds	Megaluridae	*Megalurus timoriensis*	tawny grassbird		C		2
animals	birds	Megaluridae	*Cincloramphus mathewsi*	rufous songlark		C		2
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey		C		2
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		41
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		9
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		29
animals	birds	Meliphagidae	*Acanthagenys rufogularis*	spiny-cheeked honeyeater		C		2
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		45
animals	birds	Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		C		14
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		12
animals	birds	Meliphagidae	*Gavicalis virescens*	singing honeyeater		C		12
animals	birds	Meliphagidae	*Manorina flavigula*	yellow-throated miner		C		17
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		29
animals	birds	Meliphagidae	*Caligavis chrysops*	yellow-faced honeyeater		C		1
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		7
animals	birds	Meliphagidae	*Melithreptus gularis*	black-chinned honeyeater		C		1
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		SL		36
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		32
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		12
animals	birds	Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		C		7
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		25
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		13
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		11
animals	birds	Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		C		5
animals	birds	Otididae	*Ardeotis australis*	Australian bustard		C		10
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		16
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		27
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		59

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animals	birds	Passeridae	*Passer domesticus*	house sparrow	Y			1
animals	birds	Pelecanidae	*Pelecanus conspicillatus*	Australian pelican		C		2
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		4
animals	birds	Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		C		8
animals	birds	Phalacrocoracidae	*Phalacrocorax sulcirostris*	little black cormorant		C		3
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		3
animals	birds	Phasianidae	*Coturnix pectoralis*	stubble quail		C		2
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		5
animals	birds	Podicipedidae	*Podiceps cristatus*	great crested grebe		C		1
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		6
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		27
animals	birds	Psittacidae	*Platycercus adscitus palliceps*	pale-headed rosella (southern form)		C		4
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		39
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		35
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		21
animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet		C		1
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus nuchalis*	great bowerbird		C		1
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus maculatus*	spotted bowerbird		C		5
animals	birds	Rallidae	*Fulica atra*	Eurasian coot		C		2
animals	birds	Rallidae	*Gallinula tenebrosa*	dusky moorhen		C		2
animals	birds	Rallidae	*Porphyrio melanotus*	purple swamphen		C		1
animals	birds	Rallidae	*Gallirallus philippensis*	buff-banded rail		C		1
animals	birds	Recurvirostridae	*Himantopus himantopus*	black-winged stilt		C		1
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		16
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		17
animals	birds	Strigidae	*Ninox connivens*	barking owl		C		1
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		6
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis		C		1
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		6
animals	birds	Threskiornithidae	*Platalea flavipes*	yellow-billed spoonbill		C		1
animals	birds	Threskiornithidae	*Platalea regia*	royal spoonbill		C		1
animals	birds	Timaliidae	*Zosterops lateralis*	silvereye		C		1
animals	birds	Turnicidae	*Turnix varius*	painted button-quail		C		1
animals	birds	Tytonidae	*Tyto delicatula*	eastern barn owl		C		1
animals	insects	Nymphalidae	*Danaus petilia*	lesser wanderer				1
animals	insects	Nymphalidae	*Euploea core corinna*	common crow				6
animals	insects	Nymphalidae	*Melanitis leda bankia*	common evening-brown				1
animals	insects	Nymphalidae	*Acraea andromacha andromacha*	glasswing				2
animals	insects	Nymphalidae	*Tirumala hamata hamata*	blue tiger				1
animals	insects	Nymphalidae	*Hypolimnas bolina nerina*	varied eggfly				1
animals	insects	Nymphalidae	*Junonia orithya albicincta*	blue argus				2
animals	insects	Nymphalidae	*Junonia villida calybe*	meadow argus				5
animals	insects	Papilionidae	*Papilio anactus*	dingy swallowtail				2
animals	insects	Papilionidae	*Cressida cressida cressida*	greasy swallowtail				1
animals	insects	Pieridae	*Eurema smilax*	small grass-yellow				1
animals	insects	Pieridae	*Elodina parthia*	striated pearl-white				1

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animals	insects	Pieridae	*Cepora perimale scyllara*	caper gull (Australian subspecies)				1
animals	insects	Pieridae	*Catopsilia pomona pomona*	lemon migrant				6
animals	insects	Pieridae	*Belenois java teutonia*	caper white				6
animals	mammals	Bovidae	*Bos taurus*	European cattle	Y			1
animals	mammals	Canidae	*Canis sp.*					9
animals	mammals	Canidae	*Canis lupus familiaris*	dog	Y			1
animals	mammals	Canidae	*Vulpes vulpes*	red fox	Y			1
animals	mammals	Canidae	*Canis lupus dingo*	dingo				1
animals	mammals	Dasyuridae	*Planigale ingrami*	long-tailed planigale		C		1
animals	mammals	Dasyuridae	*Sminthopsis macroura*	stripe-faced dunnart		C		14
animals	mammals	Dasyuridae	*Sminthopsis crassicaudata*	fat-tailed dunnart		C		1
animals	mammals	Emballonuridae	*Saccolaimus flaviventris*	yellow-bellied sheathtail bat		C		4
animals	mammals	Emballonuridae	*Taphozous troughtoni*	Troughton's sheathtail bat		C		2
animals	mammals	Felidae	*Felis catus*	cat	Y			4
animals	mammals	Leporidae	*Oryctolagus cuniculus*	rabbit	Y			4
animals	mammals	Macropodidae	*Petrogale inornata*	unadorned rock-wallaby		C		1
animals	mammals	Macropodidae	*Petrogale herberti*	Herbert's rock-wallaby		C		1
animals	mammals	Macropodidae	*Macropus giganteus*	eastern grey kangaroo		C		7
animals	mammals	Macropodidae	*Macropus robustus*	common wallaroo		C		2
animals	mammals	Macropodidae	*Macropus dorsalis*	black-striped wallaby		C		2
animals	mammals	Macropodidae	*Wallabia bicolor*	swamp wallaby		C		2
animals	mammals	Macropodidae	*Lagorchestes conspicillatus*	spectacled hare-wallaby		C		1
animals	mammals	Macropodidae	*Macropus rufus*	red kangaroo		C		1
animals	mammals	Miniopteridae	*Miniopterus australis*	little bent-wing bat		C		8
animals	mammals	Molossidae	*Mormopterus sp.*					2
animals	mammals	Molossidae	*Mormopterus ridei*	eastern free-tailed bat		C		2
animals	mammals	Molossidae	*Tadarida australis*	white-striped freetail bat		C		1
animals	mammals	Molossidae	*Chaerephon jobensis*	northern freetail bat		C		6
animals	mammals	Molossidae	*Mormopterus lumsdenae*	northern free-tailed bat		C		3
animals	mammals	Muridae	*Rattus fuscipes*	bush rat		C		1
animals	mammals	Muridae	*Mus musculus*	house mouse	Y			10
animals	mammals	Muridae	*Pseudomys delicatulus*	delicate mouse		C		5
animals	mammals	Muridae	*Hydromys chrysogaster*	water rat		C		1
animals	mammals	Peramelidae	*Isoodon macrourus*	northern brown bandicoot		C		1
animals	mammals	Petauridae	*Petaurus breviceps*	sugar glider		C		1
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		3
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		V	V	3
animals	mammals	Potoroidae	*Aepyprymnus rufescens*	rufous bettong		C		3
animals	mammals	Pseudocheiridae	*Petauroides volans*	greater glider		C	V	3
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox		C		1
animals	mammals	Suidae	*Sus scrofa*	pig	Y			7
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		SL		7
animals	mammals	Vespertilionidae	*Chalinolobus picatus*	little pied bat		C		10
animals	mammals	Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat		C		12
animals	mammals	Vespertilionidae	*Scotorepens greyii*	little broad-nosed bat		C		11
animals	mammals	Vespertilionidae	*Nyctophilus gouldi*	Gould's long-eared bat		C		5

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animals	mammals	Vespertilionidae	*Chalinolobus morio*	chocolate wattled bat		C		6
animals	mammals	Vespertilionidae	*Scotorepens sp.*					1
animals	mammals	Vespertilionidae	*Nyctophilus sp.*					1
animals	mammals	Vespertilionidae	*Scotorepens balstoni*	inland broad-nosed bat		C		1
animals	mammals	Vespertilionidae	*Scotorepens sanborni*	northern broad-nosed bat		C		1
animals	mammals	Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat		C		5
animals	mammals	Vespertilionidae	*Chalinolobus nigrogriseus*	hoary wattled bat		C		8
animals	mammals	Vespertilionidae	*Vespadelus baverstocki*	inland forest bat		C		1
animals	reptiles	Agamidae	*Pogona barbata*	bearded dragon		C		26
animals	reptiles	Agamidae	*Amphibolurus burnsi*	Burns's dragon		C		3
animals	reptiles	Agamidae	*Chlamydosaurus kingii*	frilled lizard		C		1
animals	reptiles	Agamidae	*Diporiphora australis*	tommy roundhead		C		13
animals	reptiles	Boidae	*Antaresia maculosa*	spotted python		C		28
animals	reptiles	Boidae	*Aspidites melanocephalus*	black-headed python		C		6
animals	reptiles	Carphodactylidae	*Nephrurus asper*	spiny knob-tailed gecko		C		7
animals	reptiles	Chelidae	*Emydura sp.*					1
animals	reptiles	Chelidae	*Chelodina longicollis*	eastern snake-necked turtle		C		1
animals	reptiles	Colubridae	*Dendrelaphis punctulatus*	green tree snake		C		1
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		1
animals	reptiles	Colubridae	*Boiga irregularis*	brown tree snake		C		2
animals	reptiles	Diplodactylidae	*Oedura monilis*	ocellated velvet gecko		C		17
animals	reptiles	Diplodactylidae	*Strophurus williamsi*	soft-spined gecko		C		21
animals	reptiles	Diplodactylidae	*Diplodactylus vittatus*	wood gecko		C		10
animals	reptiles	Diplodactylidae	*Lucasium steindachneri*	Steindachner's gecko		C		33
animals	reptiles	Diplodactylidae	*Diplodactylus platyurus*	eastern fat-tailed gecko		C		27
animals	reptiles	Elapidae	*Pseudonaja textilis*	eastern brown snake		C		7
animals	reptiles	Elapidae	*Vermicella annulata*	bandy-bandy		C		2
animals	reptiles	Elapidae	*Acanthophis antarcticus*	common death adder		V		1
animals	reptiles	Elapidae	*Brachyurophis australis*	coral snake		C		4
animals	reptiles	Elapidae	*Hoplocephalus bitorquatus*	pale-headed snake		C		3
animals	reptiles	Elapidae	*Suta suta*	myall snake		C		30
animals	reptiles	Elapidae	*Furina diadema*	red-naped snake		C		2
animals	reptiles	Elapidae	*Denisonia maculata*	ornamental snake		V	V	12
animals	reptiles	Elapidae	*Demansia psammophis*	yellow-faced whipsnake		C		21
animals	reptiles	Elapidae	*Cryptophis boschmai*	Carpentaria whip snake		C		20
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		C		50
animals	reptiles	Gekkonidae	*Gehyra versicolor*			C		1
animals	reptiles	Gekkonidae	*Gehyra catenata*	chain-backed dtella		C		7
animals	reptiles	Gekkonidae	*Gehyra dubia*	dubious dtella		C		34/1
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard		C		31
animals	reptiles	Pygopodidae	*Paradelma orientalis*	brigalow scaly-foot		C		1
animals	reptiles	Scincidae	*Cryptoblepharus virgatus sensu lato*			C		7
animals	reptiles	Scincidae	*Cryptoblepharus pulcher pulcher*	elegant snake-eyed skink		C		8
animals	reptiles	Scincidae	*Carlia pectoralis sensu lato*			C		19
animals	reptiles	Scincidae	*Glaphyromorphus punctulatus*	fine-spotted mulch-skink		C		2
animals	reptiles	Scincidae	*Lerista punctatovittata*	eastern robust slider		C		2

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animals	reptiles	Scincidae	*Cryptoblepharus pannosus*	ragged snake-eyed skink		C		4
animals	reptiles	Scincidae	*Eremiascincus fasciolatus*	narrow-banded sand swimmer		C		1
animals	reptiles	Scincidae	*Pygmaeascincus timlowi*	dwarf litter-skink		C		5
animals	reptiles	Scincidae	*Ctenotus taeniolatus*	copper-tailed skink		C		16
animals	reptiles	Scincidae	*Morethia boulengeri*	south-eastern morethia skink		C		20
animals	reptiles	Scincidae	*Lygisaurus foliorum*	tree-base litter-skink		C		19
animals	reptiles	Scincidae	*Carlia munda*	shaded-litter rainbow-skink		C		3
animals	reptiles	Scincidae	*Carlia rubigo*	orange-flanked rainbow skink		C		38
animals	reptiles	Scincidae	*Eulamprus sp.*					1
animals	reptiles	Scincidae	*Menetia greyii*	common dwarf skink		C		5
animals	reptiles	Scincidae	*Ctenotus ingrami*	unspotted yellow-sided ctenotus		C		9
animals	reptiles	Scincidae	*Lerista fragilis*	eastern mulch slider		C		11
animals	reptiles	Scincidae	*Bellatorias frerei*	major skink		C		1
animals	reptiles	Scincidae	*Ctenotus spaldingi*	straight-browed ctenotus		C		28
animals	reptiles	Scincidae	*Ctenotus strauchii*	eastern barred wedgesnout ctenotus		C		2
animals	reptiles	Scincidae	*Ctenotus allotropis*	brown-blazed wedgesnout ctenotus		C		1
animals	reptiles	Typhlopidae	*Anilios sp.*					1
animals	reptiles	Typhlopidae	*Anilios affinis*	small-headed blind snake		C		1
animals	reptiles	Typhlopidae	*Anilios ligatus*	robust blind snake		C		14
animals	reptiles	Typhlopidae	*Anilios unguirostris*	claw-snouted blind snake		C		2
animals	reptiles	Varanidae	*Varanus tristis*	black-tailed monitor		C		5
fungi	sac fungi	Cladiaceae	*Cladia muelleri*			C		1/1
fungi	sac fungi	Lecideaceae	*Lecidea*			C		3/3
fungi	sac fungi	Lichen	*Lichen*			C		1/1
fungi	sac fungi	Parmeliaceae	*Xanthoparmelia ballingalliana*			C		2/2
fungi	sac fungi	Peltulaceae	*Peltula placodizans*			C		1/1
fungi	sac fungi	Ramalinaceae	*Ramalinora glaucolivida*			C		1/1
fungi	sac fungi	Teloschistaceae	*Caloplaca cinnabarina*			C		1/1
fungi	sac fungi	Trichotheliaceae	*Porina subargillacea*			C		1/1
plants	ferns	Adiantaceae	*Cheilanthes distans*	bristly cloak fern		C		1/1
plants	ferns	Marsileaceae	*Marsilea exarata*	sway-back nardoo		C		1/1
plants	ferns	Marsileaceae	*Marsilea mutica*	shiny nardoo		C		1
plants	higher dicots	Acanthaceae	*Pseuderanthemum variabile*	pastel flower		C		2/1
plants	higher dicots	Acanthaceae	*Harnieria sp. (Lornesleigh E.J.Thompson+ CHA75)*			C		1/1
plants	higher dicots	Acanthaceae	*Dipteracanthus australasicus subsp. corynothecus*			C		1/1
plants	higher dicots	Acanthaceae	*Rostellularia adscendens*			C		26/1
plants	higher dicots	Acanthaceae	*Brunoniella australis*	blue trumpet		C		11
plants	higher dicots	Aizoaceae	*Trianthema triquetra*	red spinach		C		1
plants	higher dicots	Aizoaceae	*Trianthema portulacastrum*	black pigweed	Y			1
plants	higher dicots	Amaranthaceae	*Alternanthera denticulata var. micrantha*			C		1
plants	higher dicots	Amaranthaceae	*Kelita uncinella*			E		1/1
plants	higher dicots	Amaranthaceae	*Ptilotus*			C		1
plants	higher dicots	Amaranthaceae	*Alternanthera nana*	hairy joyweed		C		1/1
plants	higher dicots	Apiaceae	*Eryngium plantagineum*	long eryngium		C		2/2
plants	higher dicots	Apocynaceae	*Marsdenia australis*	doubah		C		1
plants	higher dicots	Apocynaceae	*Parsonsia lanceolata*	northern silkpod		C		3/2

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plants	higher dicots	Apocynaceae	*Alstonia constricta*	bitterbark		C		1
plants	higher dicots	Apocynaceae	*Wrightia saligna*			C		1/1
plants	higher dicots	Apocynaceae	*Cerbera dumicola*			NT		4/4
plants	higher dicots	Apocynaceae	*Carissa ovata*	currantbush		C		2
plants	higher dicots	Apocynaceae	*Marsdenia*			C		1
plants	higher dicots	Araliaceae	*Astrotricha biddulphiana*			C		1/1
plants	higher dicots	Asteraceae	*Minuria integerrima*	smooth minuria		C		1/1
plants	higher dicots	Asteraceae	*Sphaeromorphaea subintegra*			C		1/1
plants	higher dicots	Asteraceae	*Apowollastonia spilanthoides*			C		7/3
plants	higher dicots	Asteraceae	*Pterocaulon serrulatum var. serrulatum*			C		1/1
plants	higher dicots	Asteraceae	*Senecio pinnatifolius var. pinnatifolius*			C		2
plants	higher dicots	Asteraceae	*Calotis cuneifolia*	burr daisy		C		3/2
plants	higher dicots	Asteraceae	*Tridax procumbens*	tridax daisy	Y			1/1
plants	higher dicots	Asteraceae	*Sonchus oleraceus*	common sowthistle	Y			1
plants	higher dicots	Asteraceae	*Pluchea dentex*	bowl daisy		C		1/1
plants	higher dicots	Asteraceae	*Parthenium hysterophorus*	parthenium weed	Y			33
plants	higher dicots	Asteraceae	*Gamochaeta pensylvanica*		Y			1/1
plants	higher dicots	Asteraceae	*Acanthospermum hispidum*	star burr	Y			1/1
plants	higher dicots	Asteraceae	*Cyanthillium cinereum*			C		1/1
plants	higher dicots	Asteraceae	*Vittadinia pustulata*			C		1/1
plants	higher dicots	Asteraceae	*Peripleura hispidula*			C		1
plants	higher dicots	Asteraceae	*Streptoglossa adscendens*	desert daisy		C		1/1
plants	higher dicots	Asteraceae	*Sphaeromorphaea australis*			C		1/1
plants	higher dicots	Bignoniaceae	*Pandorea*			C		1/1
plants	higher dicots	Boraginaceae	*Trichodesma zeylanicum*			C		5
plants	higher dicots	Boraginaceae	*Ehretia membranifolia*	weeping koda		C		1
plants	higher dicots	Cactaceae	*Opuntia*			C		1
plants	higher dicots	Cactaceae	*Harrisia martinii*		Y			3
plants	higher dicots	Caesalpiniaceae	*Lysiphyllum*			C		1
plants	higher dicots	Caesalpiniaceae	*Senna*			C		1
plants	higher dicots	Caesalpiniaceae	*Senna costata*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Cassia brewsteri*			C		5
plants	higher dicots	Caesalpiniaceae	*Lysiphyllum carronii*	ebony tree		C		1
plants	higher dicots	Caesalpiniaceae	*Petalostylis labicheoides*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Senna artemisioides subsp. zygophylla*			C		1
plants	higher dicots	Campanulaceae	*Wahlenbergia queenslandica*			C		1/1
plants	higher dicots	Campanulaceae	*Lobelia leucotos*			C		1/1
plants	higher dicots	Capparaceae	*Apophyllum anomalum*	broom bush		C		3
plants	higher dicots	Capparaceae	*Capparis loranthifolia*			C		1
plants	higher dicots	Capparaceae	*Capparis*			C		1
plants	higher dicots	Capparaceae	*Capparis lasiantha*	nipan		C		4
plants	higher dicots	Capparaceae	*Capparis mitchellii*			C		1
plants	higher dicots	Caryophyllaceae	*Polycarpaea longiflora*			C		5
plants	higher dicots	Casuarinaceae	*Allocasuarina luehmannii*	bull oak		C		1
plants	higher dicots	Casuarinaceae	*Casuarina cunninghamiana*			C		1
plants	higher dicots	Celastraceae	*Denhamia cunninghamii*			C		2/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Chenopodiaceae	*Maireana microphylla*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena muricata var. muricata*			C		2
plants	higher dicots	Chenopodiaceae	*Dysphania kalpari*			C		1/1
plants	higher dicots	Chenopodiaceae	*Enchylaena tomentosa*			C		5
plants	higher dicots	Chenopodiaceae	*Enchylaena tomentosa var. tomentosa*			C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena tetracuspis*	brigalow burr		C		1/1
plants	higher dicots	Chenopodiaceae	*Sclerolaena muricata var. villosa*			C		3
plants	higher dicots	Cleomaceae	*Cleome viscosa*	tick-weed		C		6
plants	higher dicots	Clusiaceae	*Hypericum gramineum*			C		3/3
plants	higher dicots	Combretaceae	*Terminalia oblongata*			C		1
plants	higher dicots	Convolvulaceae	*Ipomoea calobra*			C		1/1
plants	higher dicots	Convolvulaceae	*Polymeria pusilla*			C		7
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides var. decumbens*			C		1
plants	higher dicots	Convolvulaceae	*Jacquemontia paniculata*			C		4/2
plants	higher dicots	Convolvulaceae	*Ipomoea brownii*			C		1/1
plants	higher dicots	Convolvulaceae	*Polymeria longifolia*	polymeria		C		17
plants	higher dicots	Convolvulaceae	*Ipomoea lonchophylla*			C		29
plants	higher dicots	Convolvulaceae	*Xenostegia tridentata*			C		1/1
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides*			C		2
plants	higher dicots	Cucurbitaceae	*Cucumis melo*			C		5
plants	higher dicots	Erythroxylaceae	*Erythroxylum australe*	cocaine tree		C		1
plants	higher dicots	Euphorbiaceae	*Croton insularis*	Queensland cascarilla		C		1/1
plants	higher dicots	Euphorbiaceae	*Bertya pedicellata*			NT		10/10
plants	higher dicots	Euphorbiaceae	*Croton phebalioides*	narrow-leaved croton		C		2/2
plants	higher dicots	Euphorbiaceae	*Euphorbia drummondii*			C		8
plants	higher dicots	Euphorbiaceae	*Euphorbia sarcostemmoides*	climbing caustic		C		1/1
plants	higher dicots	Euphorbiaceae	*Adriana tomentosa var. tomentosa*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia coghlanii*			C		6
plants	higher dicots	Fabaceae	*Crotalaria*			C		1
plants	higher dicots	Fabaceae	*Zornia muelleriana subsp. muelleriana*			C		1/1
plants	higher dicots	Fabaceae	*Glycine falcata*			C		14
plants	higher dicots	Fabaceae	*Vigna lanceolata*			C		29
plants	higher dicots	Fabaceae	*Crotalaria juncea*	sunhemp	Y			17/1
plants	higher dicots	Fabaceae	*Galactia muelleri*			C		7
plants	higher dicots	Fabaceae	*Glycine latifolia*			C		2
plants	higher dicots	Fabaceae	*Rhynchosia minima*			C		1
plants	higher dicots	Fabaceae	*Tephrosia filipes*			C		3
plants	higher dicots	Fabaceae	*Crotalaria montana*			C		4
plants	higher dicots	Fabaceae	*Glycine tomentella*	woolly glycine		C		1/1
plants	higher dicots	Fabaceae	*Sesbania cannabina*			C		7
plants	higher dicots	Fabaceae	*Aeschynomene indica*	budda pea		C		1
plants	higher dicots	Fabaceae	*Desmodium filiforme*			C		1/1
plants	higher dicots	Fabaceae	*Desmodium tortuosum*	Florida beggar-weed	Y			1/1
plants	higher dicots	Fabaceae	*Galactia tenuiflora*			C		1
plants	higher dicots	Fabaceae	*Stylosanthes hamata*		Y			2/1

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plants	higher dicots	Fabaceae	*Tephrosia barbatala*			C		1/1
plants	higher dicots	Fabaceae	*Indigofera linifolia*			C		8
plants	higher dicots	Fabaceae	*Desmodium macrocarpum*			C		7/7
plants	higher dicots	Fabaceae	*Desmodium campylocaulon*			C		8
plants	higher dicots	Fabaceae	*Macroptilium atropurpureum*	siratro	Y			1
plants	higher dicots	Fabaceae	*Vigna radiata var. sublobata*			C		5
plants	higher dicots	Fabaceae	*Rhynchosia minima var. minima*			C		18
plants	higher dicots	Fabaceae	*Zornia prostrata var. prostrata*			C		1/1
plants	higher dicots	Fabaceae	*Zornia muriculata subsp. muriculata*			C		1/1
plants	higher dicots	Fabaceae	*Indigofera australis subsp. australis*			C		1/1
plants	higher dicots	Fabaceae	*Cullen tenax*	emu-foot		C		9
plants	higher dicots	Goodeniaceae	*Goodenia glabra*			C		18
plants	higher dicots	Goodeniaceae	*Goodenia hirsuta*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia sp. (Mt Castletower M.D.Crisp 2753)*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia grandiflora*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia gracilis*			C		1/1
plants	higher dicots	Haloragaceae	*Haloragis stricta*			C		13
plants	higher dicots	Lamiaceae	*Mentha*			C		1
plants	higher dicots	Lamiaceae	*Ocimum tenuiflorum*			C		3
plants	higher dicots	Lamiaceae	*Prostanthera collina*			C		2/2
plants	higher dicots	Lamiaceae	*Leucas lavandulifolia*		Y			1/1
plants	higher dicots	Lamiaceae	*Teucrium integrifolium*			C		1/1
plants	higher dicots	Lamiaceae	*Basilicum polystachyon*			C		1
plants	higher dicots	Loganiaceae	*Mitrasacme*			C		1/1
plants	higher dicots	Loranthaceae	*Lysiana subfalcata*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus sp. (Emerald S.L.Everist 2124)*			C		1/1
plants	higher dicots	Malvaceae	*Sida sp. (Charters Towers E.J.THompson+ CHA456)*			C		1/1
plants	higher dicots	Malvaceae	*Abutilon*			C		1/1
plants	higher dicots	Malvaceae	*Sida spinosa*	spiny sida	Y			23/1
plants	higher dicots	Malvaceae	*Sida corrugata*			C		22
plants	higher dicots	Malvaceae	*Abutilon hannii*			C		2
plants	higher dicots	Malvaceae	*Sida fibulifera*			C		1/1
plants	higher dicots	Malvaceae	*Sida trichopoda*			C		15/1
plants	higher dicots	Malvaceae	*Abutilon fraseri*	dwarf lantern flower		C		1
plants	higher dicots	Malvaceae	*Hibiscus sturtii*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus trionum*			C		29
plants	higher dicots	Malvaceae	*Sida atherophora*			C		1/1
plants	higher dicots	Malvaceae	*Sida everistiana*			C		1
plants	higher dicots	Malvaceae	*Sida cunninghamii*			C		2
plants	higher dicots	Malvaceae	*Hibiscus divaricatus*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus meraukensis*	Merauke hibiscus		C		1
plants	higher dicots	Malvaceae	*Hibiscus verdcourtii*			C		1/1
plants	higher dicots	Malvaceae	*Abelmoschus ficulneus*	native rosella		C		12/1
plants	higher dicots	Malvaceae	*Abutilon micropetalum*			C		1/1
plants	higher dicots	Malvaceae	*Malvastrum americanum*		Y			20
plants	higher dicots	Malvaceae	*Sida aprica var. aprica*			C		1/1

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plants	higher dicots	Malvaceae	*Sida sp. (Aramac E.J.Thompson+ JER192)*			C		1/1
plants	higher dicots	Meliaceae	*Owenia x reliqua*			C		1/1
plants	higher dicots	Meliaceae	*Owenia acidula*	emu apple		C		2
plants	higher dicots	Mimosaceae	*Acacia faucium*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia conferta*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia oswaldii*	miljee		C		1
plants	higher dicots	Mimosaceae	*Acacia shirleyi*	lancewood		C		1
plants	higher dicots	Mimosaceae	*Acacia excelsa*			C		2
plants	higher dicots	Mimosaceae	*Acacia crassa*			C		1
plants	higher dicots	Mimosaceae	*Neptunia monosperma*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia fodinalis*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia bancroftiorum*			C		3/3
plants	higher dicots	Mimosaceae	*Vachellia farnesiana*		Y			23
plants	higher dicots	Mimosaceae	*Archidendropsis basaltica*	red lancewood		C		2
plants	higher dicots	Mimosaceae	*Acacia blakei subsp. blakei*			C		1/1
plants	higher dicots	Mimosaceae	*Neptunia gracilis forma gracilis*			C		22
plants	higher dicots	Mimosaceae	*Acacia julifera subsp. curvinervia*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia harpophylla*	brigalow		C		2
plants	higher dicots	Mimosaceae	*Acacia catenulata*	bendee		C		1
plants	higher dicots	Mimosaceae	*Prosopis pallida*		Y			1/1
plants	higher dicots	Molluginaceae	*Glinus lotoides*	hairy carpet weed		C		1/1
plants	higher dicots	Myrtaceae	*Corymbia tessellaris*	Moreton Bay ash		C		1
plants	higher dicots	Myrtaceae	*Eucalyptus tenuipes*	narrow-leaved white mahogany		C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus populnea*	poplar box		C		1
plants	higher dicots	Myrtaceae	*Eucalyptus exserta*	Queensland peppermint		C		2/2
plants	higher dicots	Myrtaceae	*Melaleuca nervosa*			C		2/1
plants	higher dicots	Myrtaceae	*Eucalyptus crebra*	narrow-leaved red ironbark		C		1
plants	higher dicots	Myrtaceae	*Corymbia aureola*			C		6/6
plants	higher dicots	Myrtaceae	*Corymbia clarksoniana*			C		2/1
plants	higher dicots	Myrtaceae	*Lysicarpus angustifolius*	budgeroo		C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus drepanophylla*			C		1/1
plants	higher dicots	Myrtaceae	*Micromyrtus capricornia*			C		1/1
plants	higher dicots	Myrtaceae	*Rhodamnia pauciovulata*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus tholiformis*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus orgadophila*	mountain coolibah		C		1
plants	higher dicots	Myrtaceae	*Corymbia erythrophloia*	variable-barked bloodwood		C		3
plants	higher dicots	Myrtaceae	*Eucalyptus thozetiana*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus persistens*			C		2/2
plants	higher dicots	Nyctaginaceae	*Boerhavia dominii*			C		2
plants	higher dicots	Nyctaginaceae	*Boerhavia burbidgeana*			C		1
plants	higher dicots	Oleaceae	*Jasminum didymum subsp. lineare*			C		1
plants	higher dicots	Onagraceae	*Ludwigia octovalvis*	willow primrose		C		1
plants	higher dicots	Oxalidaceae	*Oxalis radicosa*			C		3
plants	higher dicots	Passifloraceae	*Passiflora foetida*		Y			1/1
plants	higher dicots	Phyllanthaceae	*Phyllanthus carpentariae*			C		1/1
plants	higher dicots	Phyllanthaceae	*Phyllanthus virgatus*			C		10

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plants	higher dicots	Phyllanthaceae	*Phyllanthus maderaspatensis*			C		3
plants	higher dicots	Phyllanthaceae	*Phyllanthus*			C		1/1
plants	higher dicots	Picrodendraceae	*Petalostigma pubescens*	quinine tree		C		1
plants	higher dicots	Pittosporaceae	*Bursaria incana*			C		1/1
plants	higher dicots	Pittosporaceae	*Pittosporum angustifolium*			C		1
plants	higher dicots	Plantaginaceae	*Scoparia dulcis*	scoparia	Y			1/1
plants	higher dicots	Polygalaceae	*Polygala crassitesta*			C		13
plants	higher dicots	Polygalaceae	*Polygala pycnantha*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca oleracea*	pigweed	Y			1
plants	higher dicots	Proteaceae	*Grevillea pteridifolia*	golden parrot tree		C		2/1
plants	higher dicots	Proteaceae	*Hakea lorea subsp. lorea*			C		1
plants	higher dicots	Proteaceae	*Persoonia amaliae*			C		1/1
plants	higher dicots	Rhamnaceae	*Alphitonia excelsa*	soap tree		C		1
plants	higher dicots	Rhamnaceae	*Ventilago viminalis*	supplejack		C		5
plants	higher dicots	Rubiaceae	*Larsenaikia ochreata*			C		2/2
plants	higher dicots	Rubiaceae	*Richardia brasiliensis*	white eye	Y			1/1
plants	higher dicots	Rubiaceae	*Spermacoce brachystema*			C		1/1
plants	higher dicots	Rubiaceae	*Oldenlandia coerulescens*			C		1/1
plants	higher dicots	Rubiaceae	*Oldenlandia mitrasacmoides subsp. trachymenoides*			C		6
plants	higher dicots	Rutaceae	*Flindersia dissosperma*			C		1
plants	higher dicots	Rutaceae	*Phebalium glandulosum subsp. glandulosum*			C		1/1
plants	higher dicots	Santalaceae	*Santalum lanceolatum*			C		3
plants	higher dicots	Sapindaceae	*Atalaya hemiglauca*			C		5
plants	higher dicots	Sapindaceae	*Alectryon oleifolius subsp. elongatus*			C		3
plants	higher dicots	Sapindaceae	*Dodonaea viscosa subsp. spatulata*			C		1/1
plants	higher dicots	Sapindaceae	*Diploglottis macrantha*			C		1
plants	higher dicots	Sapindaceae	*Atalaya*			C		1
plants	higher dicots	Sapotaceae	*Planchonella pohlmaniana var. (Gilbert River C.T.White 1409)*			C		1/1
plants	higher dicots	Sapotaceae	*Planchonella pohlmaniana*			C		2/2
plants	higher dicots	Scrophulariaceae	*Eremophila bignoniiflora*	eurah		C		1
plants	higher dicots	Scrophulariaceae	*Eremophila debilis*	winter apple		C		4
plants	higher dicots	Scrophulariaceae	*Eremophila mitchellii*			C		1
plants	higher dicots	Scrophulariaceae	*Eremophila longifolia*	berrigan		C		1/1
plants	higher dicots	Scrophulariaceae	*Myoporum acuminatum*	coastal boobialla		C		3/2
plants	higher dicots	Scrophulariaceae	*Eremophila maculata*			C		1
plants	higher dicots	Solanaceae	*Solanum adenophorum*			E		1/1
plants	higher dicots	Solanaceae	*Solanum parvifolium subsp. parvifolium*			C		2/2
plants	higher dicots	Solanaceae	*Solanum esuriale*	quena		C		8
plants	higher dicots	Solanaceae	*Datura stramonium*	common thornapple	Y			3
plants	higher dicots	Sparrmanniaceae	*Grewia latifolia*	dysentery plant		C		3
plants	higher dicots	Sparrmanniaceae	*Grewia retusifolia*			C		2
plants	higher dicots	Sparrmanniaceae	*Corchorus aestuans*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Corchorus trilocularis*			C		11
plants	higher dicots	Sterculiaceae	*Brachychiton populneus subsp. trilobus*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium eglandulosum*			C		1/1

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plants	higher dicots	Thymelaeaceae	*Pimelea microcephala*			C		1
plants	higher dicots	Thymelaeaceae	*Pimelea haematostachya*			C		19
plants	higher dicots	Verbenaceae	*Verbena macrostachya*			C		1
plants	higher dicots	Verbenaceae	*Glandularia aristigera*		Y			1
plants	higher dicots	Zygophyllaceae	*Tribulus eichlerianus*	bull head		C		1
plants	liverworts	Frullaniaceae	*Frullania*			C		1/1
plants	lower dicots	Phrymaceae	*Glossostigma diandrum*			C		1/1
plants	monocots	Amaryllidaceae	*Crinum*			C		1
plants	monocots	Asphodelaceae	*Bulbine bulbosa*	golden lily		C		2
plants	monocots	Commelinaceae	*Commelina diffusa*	wandering jew		C		4
plants	monocots	Commelinaceae	*Commelina*			C		1
plants	monocots	Commelinaceae	*Cyanotis axillaris*			C		1/1
plants	monocots	Cyperaceae	*Cyperus concinnus*			C		2/1
plants	monocots	Cyperaceae	*Cyperus exaltatus*	tall flatsedge		C		1
plants	monocots	Cyperaceae	*Cyperus javanicus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus compressus*		Y			1/1
plants	monocots	Cyperaceae	*Cyperus isabellinus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus victoriensis*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis quinquangularis*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectiella dissachantha*			C		1/1
plants	monocots	Cyperaceae	*Cyperus polystachyos var. polystachyos*			C		1/1
plants	monocots	Cyperaceae	*Cyperus gracilis*			C		1/1
plants	monocots	Cyperaceae	*Cyperus gilesii*			C		22
plants	monocots	Cyperaceae	*Cyperus betchei*			C		2
plants	monocots	Cyperaceae	*Cyperus fulvus*			C		1/1
plants	monocots	Cyperaceae	*Gahnia aspera*			C		1/1
plants	monocots	Cyperaceae	*Cyperus iria*			C		2/2
plants	monocots	Hemerocallidaceae	*Dianella longifolia*			C		3
plants	monocots	Juncaceae	*Juncus subglaucus*			C		1/1
plants	monocots	Laxmanniaceae	*Laxmannia gracilis*	slender wire lily		C		1/1
plants	monocots	Laxmanniaceae	*Lomandra longifolia*			C		1/1
plants	monocots	Laxmanniaceae	*Lomandra multiflora*			C		3
plants	monocots	Poaceae	*Panicum effusum*			C		2/1
plants	monocots	Poaceae	*Sehima nervosum*			C		1/1
plants	monocots	Poaceae	*Setaria surgens*			C		2/2
plants	monocots	Poaceae	*Chloris truncata*			C		1
plants	monocots	Poaceae	*Digitaria blakei*			C		1/1
plants	monocots	Poaceae	*Eriochloa crebra*	spring grass		C		29/1
plants	monocots	Poaceae	*Themeda triandra*	kangaroo grass		C		10/1
plants	monocots	Poaceae	*Astrebla lappacea*	curly mitchell grass		C		7
plants	monocots	Poaceae	*Cenchrus ciliaris*		Y			37/1
plants	monocots	Poaceae	*Digitaria brownii*			C		1/1
plants	monocots	Poaceae	*Enneapogon virens*			C		3/2
plants	monocots	Poaceae	*Sporobolus caroli*	fairy grass		C		3
plants	monocots	Poaceae	*Sporobolus creber*			C		15
plants	monocots	Poaceae	*Thellungia advena*	coolibah grass		C		5/2

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plants	monocots	Poaceae	*Aristida latifolia*	feathertop wiregrass		C		30/2
plants	monocots	Poaceae	*Aristida leptopoda*	white speargrass		C		12
plants	monocots	Poaceae	*Aristida personata*			C		4
plants	monocots	Poaceae	*Astrebla elymoides*	hoop mitchell grass		C		3
plants	monocots	Poaceae	*Astrebla squarrosa*	bull mitchell grass		C		24
plants	monocots	Poaceae	*Chloris divaricata*			C		2/2
plants	monocots	Poaceae	*Chrysopogon fallax*			C		4/2
plants	monocots	Poaceae	*Digitaria ciliaris*	summer grass	Y			1/1
plants	monocots	Poaceae	*Echinochloa colona*	awnless barnyard grass	Y			1/1
plants	monocots	Poaceae	*Eragrostis sororia*			C		2/1
plants	monocots	Poaceae	*Eriachne mucronata*			C		1
plants	monocots	Poaceae	*Ophiuros exaltatus*			C		3
plants	monocots	Poaceae	*Digitaria ammophila*	silky umbrella grass		C		1
plants	monocots	Poaceae	*Digitaria ramularis*			C		1/1
plants	monocots	Poaceae	*Eragrostis elongata*			C		1/1
plants	monocots	Poaceae	*Eragrostis speciosa*			C		1/1
plants	monocots	Poaceae	*Leptochloa digitata*			C		1
plants	monocots	Poaceae	*Bothriochloa pertusa*		Y			3/2
plants	monocots	Poaceae	*Dichanthium sericeum*			C		29
plants	monocots	Poaceae	*Enneapogon truncatus*			C		22
plants	monocots	Poaceae	*Eragrostis lacunaria*	purple lovegrass		C		2/1
plants	monocots	Poaceae	*Eragrostis tenellula*	delicate lovegrass		C		6/1
plants	monocots	Poaceae	*Paspalum mandiocanum*		Y			1/1
plants	monocots	Poaceae	*Sporobolus scabridus*			C		1/1
plants	monocots	Poaceae	*Alloteropsis cimicina*			C		1/1
plants	monocots	Poaceae	*Dichanthium aristatum*	angleton grass	Y			1/1
plants	monocots	Poaceae	*Heteropogon contortus*	black speargrass		C		16
plants	monocots	Poaceae	*Iseilema vaginiflorum*	red flinders grass		C		34/1
plants	monocots	Poaceae	*Pseudoraphis paradoxa*	slender mudgrass		C		1/1
plants	monocots	Poaceae	*Schizachyrium fragile*	firegrass		C		1/1
plants	monocots	Poaceae	*Setaria oplismenoides*			C		1/1
plants	monocots	Poaceae	*Alloteropsis semialata*	cockatoo grass		C		1
plants	monocots	Poaceae	*Arundinella nepalensis*	reedgrass		C		1/1
plants	monocots	Poaceae	*Bothriochloa ewartiana*	desert bluegrass		C		30/1
plants	monocots	Poaceae	*Brachyachne convergens*	common native couch		C		32
plants	monocots	Poaceae	*Enteropogon acicularis*	curly windmill grass		C		2
plants	monocots	Poaceae	*Moorochloa eruciformis*		Y			8
plants	monocots	Poaceae	*Panicum queenslandicum*			C		8
plants	monocots	Poaceae	*Paspalidium globoideum*	sago grass		C		21
plants	monocots	Poaceae	*Setaria paspalidioides*			C		1/1
plants	monocots	Poaceae	*Thyridolepis xerophila*			C		1/1
plants	monocots	Poaceae	*Urochloa mosambicensis*	sabi grass	Y			1/1
plants	monocots	Poaceae	*Ancistrachne uncinulata*	hooky grass		C		2/2
plants	monocots	Poaceae	*Dactyloctenium radulans*	button grass		C		1
plants	monocots	Poaceae	*Cenchrus pennisetiformis*		Y			1/1
plants	monocots	Poaceae	*Paspalidium albovillosum*			C		2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Thaumastochloa pubescens*			C		1/1
plants	monocots	Poaceae	*Bothriochloa erianthoides*	satintop grass		C		2
plants	monocots	Poaceae	*Dichanthium queenslandicum*			V	E	2/2
plants	monocots	Poaceae	*Diplachne fusca var. fusca*			C		1/1
plants	monocots	Poaceae	*Eriochloa pseudoacrotricha*			C		25
plants	monocots	Poaceae	*Eragrostis longipedicellata*			C		1/1
plants	monocots	Poaceae	*Hyparrhenia rufa subsp. rufa*		Y			1/1
plants	monocots	Poaceae	*Aristida calycina var. calycina*			C		1/1
plants	monocots	Poaceae	*Aristida benthamii var. benthamii*			C		1/1
plants	monocots	Poaceae	*Aristida holathera var. holathera*			C		3/2
plants	monocots	Poaceae	*Chloris divaricata var. divaricata*	slender chloris		C		1/1
plants	monocots	Poaceae	*Dichanthium sericeum subsp. sericeum*			C		4/4
plants	monocots	Poaceae	*Bothriochloa decipiens var. decipiens*			C		2/2
plants	monocots	Poaceae	*Panicum decompositum var. decompositum*			C		24/1
plants	monocots	Poaceae	*Aristida jerichoensis var. subspinulifera*			C		3/3
plants	monocots	Poaceae	*Calyptochloa gracillima subsp. gracillima*			C		4/4
plants	monocots	Poaceae	*Eriachne mucronata forma (Alpha C.E.Hubbard 7882)*			C		1/1
plants	monocots	Poaceae	*Poaceae*			C		1
plants	monocots	Poaceae	*Eragrostis*			C		1
plants	monocots	Poaceae	*Eriachne rara*			C		2/2
plants	monocots	Poaceae	*Melinis repens*	red natal grass	Y			11
plants	monocots	Poaceae	*Sarga plumosum*			C		1/1
plants	monocots	Poaceae	*Chloris inflata*	purpletop chloris	Y			1
plants	monocots	Poaceae	*Chloris virgata*	feathertop rhodes grass	Y			8
plants	monocots	Pontederiaceae	*Monochoria cyanea*			C		1
plants	mosses	Erpodiaceae	*Erpodium hodgkinsoniae*			C		1/1
plants	mosses	Fabroniaceae	*Fabronia australis*			C		1/1
plants	mosses	Ptychomitriaceae	*Ptychomitrium muelleri*			C		1/1
plants	mosses	Stereophyllaceae	*Stereophyllum radiculosum*			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

Queensland Herbarium (HERBRECS) Database search results

Table C1: Queensland Herbarium (HERBRECS) database search results for the search area

Family Name	Botanical Name	NC Act Status[1]
Malvaceae	*Abelmoschus ficulneus (L.) Wight & Arn. ex Wight*	LC
Cyperaceae	*Abildgaardia ovata (Burm.f.) Kral*	LC
Malvaceae	*Abutilon*	LC
Malvaceae	*Abutilon fraseri (Hook.) Hook. ex Walp. subsp. fraseri*	LC
Malvaceae	*Abutilon micropetalum Benth.*	LC
Malvaceae	*Abutilon subviscosum Benth.*	LC
Mimosaceae	*Acacia bancroftiorum Maiden*	LC
Mimosaceae	*Acacia blakei Pedley subsp. blakei*	LC
Mimosaceae	*Acacia conferta A.Cunn. ex Benth.*	LC
Mimosaceae	*Acacia cretata Pedley - A.leiocalyx (Domin) Pedley*	LC
Mimosaceae	*Acacia faucium Pedley*	LC
Mimosaceae	*Acacia fodinalis Pedley*	LC
Mimosaceae	*Acacia holosericea A.Cunn. ex G.Don*	LC
Mimosaceae	*Acacia julifera Benth. subsp. julifera*	LC
Mimosaceae	*Acacia julifera subsp. curvinervia (Maiden) Pedley*	LC
Mimosaceae	*Acacia ligulata A.Cunn. ex Benth.*	LC
Mimosaceae	*Acacia shirleyi Maiden*	LC
Asteraceae	*Acanthospermum hispidum DC.*	*
Euphorbiaceae	*Adriana tomentosa Gaudich. var. tomentosa*	LC
Poaceae	*Alloteropsis cimicina (L.) Stapf*	LC
Poaceae	*Ancistrachne uncinulata (R.Br.) S.T.Blake*	LC
Rubiaceae	*Antirhea putaminosa (F.Muell.) F.M.Bailey*	LC
Asteraceae	*Apowollastonia spilanthoides (F.Muell.) Orchard*	LC
Poaceae	*Aristida benthamii Henrard var. benthamii*	LC
Poaceae	*Aristida calycina R.Br. var. calycina*	LC
Poaceae	*Aristida caput-medusae Domin*	LC
Poaceae	*Aristida holathera Domin var. holathera*	LC
Poaceae	*Aristida jerichoensis var. subspinulifera Henrard*	LC
Poaceae	*Aristida latifolia Domin*	LC
Poaceae	*Arundinella nepalensis Trin.*	LC
Araliaceae	*Astrotricha biddulphiana F.Muell.*	LC
Chenopodiaceae	*Atriplex lindleyi Moq.*	LC
Pittosporaceae	*Auranticarpa rhombifolia (A.Cunn. ex Hook.) L.Cayzer, Crisp & I.Telford*	LC
Euphorbiaceae	*Bertya pedicellata F.Muell.*	NT
Poaceae	*Bothriochloa decipiens (Hack.) C.E.Hubb. var. decipiens*	LC
Poaceae	*Bothriochloa erianthoides (F.Muell.) C.E.Hubb.*	LC
Poaceae	*Bothriochloa ewartiana (Domin) C.E.Hubb.*	LC
Poaceae	*Bothriochloa pertusa (L.) A.Camus*	*
Sterculiaceae	*Brachychiton populneus subsp. trilobus Guymer*	LC
Phyllanthaceae	*Breynia oblongifolia (Muell.Arg.) Muell.Arg.*	LC

Family Name	Botanical Name	NC Act Status[1]
Cyperaceae	*Bulbostylis barbata (Rottb.) C.B.Clarke*	LC
Pittosporaceae	*Bursaria incana Lindl.*	LC
Teloschistaceae	*Caloplaca cinnabarina (Ach.) Zahlbr.*	LC
Asteraceae	*Calotis cuneifolia R.Br.*	LC
Asteraceae	*Calotis squamigera C.T.White*	LC
Poaceae	*Calyptochloa gracillima C.E.Hubb. subsp. gracillima*	LC
Poaceae	*Cenchrus ciliaris L.*	*
Poaceae	*Cenchrus pennisetiformis Hochst. & Steud.*	*
Apocynaceae	*Cerbera dumicola P.I.Forst.*	NT
Adiantaceae	*Cheilanthes distans (R.Br.) Mett.*	LC
Poaceae	*Chloris divaricata R.Br.*	LC
Poaceae	*Chloris divaricata R.Br. var. divaricata*	LC
Poaceae	*Chrysopogon fallax S.T.Blake*	LC
Rutaceae	*Citrus glauca (Lindl.) Burkill*	LC
Cladiaceae	*Cladia muelleri (Hampe) Parnmen & Lumbsch*	LC
Lamiaceae	*Clerodendrum floribundum R.Br.*	LC
Rubiaceae	*Coelospermum reticulatum (F.Muell.) Benth.*	LC
Sparrmanniaceae	*Corchorus aestuans L.*	LC
Myrtaceae	*Corymbia aureola (Brooker & A.R.Bean) K.D.Hill & L.A.S.Johnson*	LC
Myrtaceae	*Corymbia clarksoniana (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson*	LC
Fabaceae	*Crotalaria juncea L.*	*
Fabaceae	*Crotalaria laburnifolia L.*	*
Euphorbiaceae	*Croton insularis Baill.*	LC
Euphorbiaceae	*Croton phebalioides F.Muell. ex Muell.Arg.*	LC
Commelinaceae	*Cyanotis axillaris (L.) D.Don*	LC
Asteraceae	*Cyanthillium cinereum (L.) H.Rob.*	LC
Poaceae	*Cymbopogon refractus (R.Br.) A.Camus*	LC
Cyperaceae	*Cyperus bifax C.B.Clarke*	LC
Cyperaceae	*Cyperus compressus L.*	*
Cyperaceae	*Cyperus concinnus R.Br.*	LC
Cyperaceae	*Cyperus difformis L.*	LC
Cyperaceae	*Cyperus esculentus L.*	*
Cyperaceae	*Cyperus fulvus R.Br.*	LC
Cyperaceae	*Cyperus gracilis R.Br.*	LC
Cyperaceae	*Cyperus iria L.*	LC
Cyperaceae	*Cyperus isabellinus K.L.Wilson*	LC
Cyperaceae	*Cyperus javanicus Houtt.*	LC
Cyperaceae	*Cyperus leiocaulon Benth.*	LC
Cyperaceae	*Cyperus polystachyos Rottb. var. polystachyos*	LC
Cyperaceae	*Cyperus sesquiflorus (Torr.) Mattf. & Kuek.*	*
Cyperaceae	*Cyperus victoriensis C.B.Clarke*	LC
Poaceae	*Dactyloctenium radulans (R.Br.) P.Beauv.*	LC

Family Name	Botanical Name	NC Act Status[1]
Celastraceae	*Denhamia cunninghamii (Hook.) M.P.Simmons*	LC
Celastraceae	*Denhamia oleaster (Lindl.) F.Muell.*	LC
Fabaceae	*Desmodium filiforme Zoll. & Moritzi*	LC
Fabaceae	*Desmodium macrocarpum Domin*	LC
Fabaceae	*Desmodium tortuosum (Sw.) DC.*	*
Poaceae	*Dichanthium annulatum (Forssk.) Stapf*	*
Poaceae	*Dichanthium aristatum (Poir.) C.E.Hubb.*	*
Poaceae	*Dichanthium queenslandicum B.K.Simon*	V
Poaceae	*Dichanthium sericeum (R.Br.) A.Camus subsp. sericeum*	LC
Poaceae	*Dichanthium setosum S.T.Blake*	LC
Poaceae	*Digitaria blakei Henrard*	LC
Poaceae	*Digitaria brownii (Roem. & Schult.) Hughes*	LC
Poaceae	*Digitaria ciliaris (Retz.) Koeler*	*
Poaceae	*Digitaria ramularis (Trin.) Henrard*	LC
Poaceae	*Dinebra decipiens var. asthenes (Roem. & Schult.) P.M.Peterson & N.Snow*	LC
Poaceae	*Dinebra ligulata (Lazarides) P.M.Peterson & N.Snow*	LC
Poaceae	*Diplachne fusca (L.) P.Beauv. ex Roem. & Schult. var. fusca*	LC
Acanthaceae	*Dipteracanthus australasicus F.Muell.*	LC
Acanthaceae	*Dipteracanthus australasicus subsp. corynothecus (F.Muell. ex Benth.) R.M.Barker*	LC
Sapindaceae	*Dodonaea viscosa subsp. spatulata (Sm.) J.G.West*	LC
Chenopodiaceae	*Dysphania kalpari Paul G.Wilson*	LC
Poaceae	*Echinochloa colona (L.) Link*	*
Chenopodiaceae	*Einadia nutans (R.Br.) A.J.Scott subsp. nutans*	LC
Chenopodiaceae	*Einadia nutans subsp. linifolia (R.Br.) Paul G.Wilson*	LC
Celastraceae	*Elaeodendron australe Vent. var. australe*	LC
Chenopodiaceae	*Enchylaena tomentosa R.Br. var. tomentosa*	LC
Poaceae	*Enneapogon lindleyanus (Domin) C.E.Hubb.*	LC
Poaceae	*Enneapogon truncatus Kakudidi*	LC
Poaceae	*Enneapogon virens (Lindl.) Kakudidi*	LC
Poaceae	*Eragrostis elongata (Willd.) J.Jacq.*	LC
Poaceae	*Eragrostis exigua Lazarides*	LC
Poaceae	*Eragrostis lacunaria F.Muell. ex Benth.*	LC
Poaceae	*Eragrostis longipedicellata B.K.Simon*	LC
Poaceae	*Eragrostis sororia Domin*	LC
Poaceae	*Eragrostis speciosa (Roem. & Schult.) Steud.*	LC
Poaceae	*Eragrostis tenellula (Kunth) Steud.*	LC
Scrophulariaceae	*Eremophila longifolia (R.Br.) F.Muell.*	LC
Poaceae	*Eriachne mucronata forma (Alpha C.E.Hubbard 7882)*	LC
Poaceae	*Eriachne rara R.Br.*	LC
Poaceae	*Eriochloa crebra S.T.Blake*	LC
Poaceae	*Eriochloa pseudoacrotricha (Stapf ex Thell.) J.M.Black*	LC
Erpodiaceae	*Erpodium hodgkinsoniae Hampe & Muell.Hal.*	LC

Family Name	Botanical Name	NC Act Status[1]
Apiaceae	*Eryngium plantagineum F.Muell.*	LC
Erythroxylaceae	*Erythroxylum australe F.Muell.*	LC
Myrtaceae	*Eucalyptus cloeziana F.Muell.*	LC
Myrtaceae	*Eucalyptus crebra F.Muell.*	LC
Myrtaceae	*Eucalyptus crebra F.Muell. x E.orgadophila Maiden & Blakely*	LC
Myrtaceae	*Eucalyptus crebra F.Muell. x E.populnea F.Muell.*	LC
Myrtaceae	*Eucalyptus drepanophylla F.Muell. ex Benth.*	LC
Myrtaceae	*Eucalyptus exserta F.Muell.*	LC
Myrtaceae	*Eucalyptus persistens L.A.S.Johnson & K.D.Hill*	LC
Myrtaceae	*Eucalyptus tenuipes (Maiden & Blakely) Blakely & C.T.White*	LC
Myrtaceae	*Eucalyptus tholiformis A.R.Bean & Brooker*	LC
Myrtaceae	*Eucalyptus thozetiana F.Muell. ex R.T.Baker*	LC
Euphorbiaceae	*Euphorbia*	LC
Euphorbiaceae	*Euphorbia drummondii Boiss.*	LC
Euphorbiaceae	*Euphorbia sarcostemmoides J.H.Willis*	LC
Convolvulaceae	*Evolvulus alsinoides var. decumbens (R.Br.) Ooststr.*	LC
Fabroniaceae	*Fabronia australis Hook.*	LC
Cyperaceae	*Fimbristylis quinquangularis (M.Vahl) Kunth*	LC
Rutaceae	*Flindersia australis R.Br.*	LC
Frullaniaceae	*Frullania*	LC
Cyperaceae	*Gahnia aspera (R.Br.) Spreng.*	LC
Asteraceae	*Gamochaeta pensylvanica (Willd.) Cabrera*	*
Rutaceae	*Geijera salicifolia Schott*	LC
Molluginaceae	*Glinus lotoides L.*	LC
Phrymaceae	*Glossostigma diandrum (L.) Kuntze*	LC
Fabaceae	*Glycine tomentella Hayata*	LC
Goodeniaceae	*Goodenia gracilis R.Br.*	LC
Goodeniaceae	*Goodenia hirsuta F.Muell.*	LC
Goodeniaceae	*Goodenia sp. (Mt Castletower M.D.Crisp 2753)*	LC
Proteaceae	*Grevillea parallela Knight*	LC
Proteaceae	*Grevillea pteridifolia Knight*	LC
Proteaceae	*Hakea lorea (R.Br.) R.Br. subsp. lorea*	LC
Acanthaceae	*Harnieria sp. (Lornesleigh E.J.Thompson+ CHA75)*	LC
Malvaceae	*Hibiscus divaricatus Graham*	LC
Malvaceae	*Hibiscus heterophyllus Vent.*	LC
Malvaceae	*Hibiscus sp. (Emerald S.L.Everist 2124)*	LC
Malvaceae	*Hibiscus sturtii Hook.*	LC
Malvaceae	*Hibiscus verdcourtii Craven*	LC
Fabaceae	*Hovea longipes Benth.*	LC
Violaceae	*Hybanthus enneaspermus (L.) F.Muell.*	LC
Violaceae	*Hybanthus stellarioides (Domin) P.I.Forst.*	LC
Poaceae	*Hyparrhenia rufa (Nees) Stapf subsp. rufa*	*
Clusiaceae	*Hypericum gramineum G.Forst.*	LC

Family Name	Botanical Name	NC Act Status[1]
Fabaceae	*Indigofera australis Willd. subsp. australis*	LC
Fabaceae	*Indigofera linnaei Ali*	LC
Convolvulaceae	*Ipomoea brownii Roem. & Schult.*	LC
Convolvulaceae	*Ipomoea calobra W.Hill & F.Muell.*	LC
Convolvulaceae	*Ipomoea plebeia R.Br.*	LC
Convolvulaceae	*Ipomoea polymorpha Roem. & Schult.*	LC
Poaceae	*Iseilema macratherum Domin*	LC
Poaceae	*Iseilema vaginiflorum Domin*	LC
Convolvulaceae	*Jacquemontia paniculata (Burm.f.) Hallier f.*	LC
Juncaceae	*Juncus subglaucus L.A.S.Johnson*	LC
Amaranthaceae	*Kelita uncinella A.R.Bean*	E
Byttneriaceae	*Keraudrenia hookeriana Walp.*	LC
Rubiaceae	*Larsenaikia ochreata (F.Muell.) Tirveng.*	LC
Laxmanniaceae	*Laxmannia gracilis R.Br.*	LC
Lecideaceae	*Lecidea*	LC
Lamiaceae	*Leucas lavandulifolia Sm.*	*
Lichen	*Lichen*	LC
Campanulaceae	*Lobelia leucotos Albr.*	LC
Laxmanniaceae	*Lomandra longifolia Labill.*	LC
Myrtaceae	*Lophostemon grandiflorus subsp. riparius (Domin) Peter G.Wilson & J.T.Waterh.*	LC
Loranthaceae	*Lysiana subfalcata (Hook.) Barlow*	LC
Myrtaceae	*Lysicarpus angustifolius (Hook.) Druce*	LC
Chenopodiaceae	*Maireana microphylla (Moq.) Paul G.Wilson*	LC
Marsileaceae	*Marsilea exarata A.Braun*	LC
Myrtaceae	*Melaleuca fluviatilis Barlow*	LC
Myrtaceae	*Melaleuca nervosa (Lindl.) Cheel*	LC
Myrtaceae	*Micromyrtus capricornia A.R.Bean*	LC
Phrymaceae	*Mimulus*	LC
Asteraceae	*Minuria integerrima (DC.) Benth.*	LC
Loganiaceae	*Mitrasacme*	LC
Rutaceae	*Murraya ovatifoliolata Domin*	LC
Scrophulariaceae	*Myoporum acuminatum R.Br.*	LC
Mimosaceae	*Neptunia monosperma F.Muell. ex Benth.*	LC
Rubiaceae	*Oldenlandia coerulescens (F.Muell.) F.Muell.*	LC
Meliaceae	*Owenia x reliqua P.I.Forst.*	LC
Poaceae	*Oxychloris scariosa (F.Muell.) Lazarides*	LC
Bignoniaceae	*Pandorea*	LC
Poaceae	*Panicum buncei F.Muell. ex Benth.*	LC
Poaceae	*Panicum decompositum R.Br. var. decompositum*	LC
Poaceae	*Panicum effusum R.Br.*	LC
Poaceae	*Panicum simile Domin*	LC
Apocynaceae	*Parsonsia lanceolata R.Br.*	LC

Family Name	Botanical Name	NC Act Status[1]
Asteraceae	*Parthenium hysterophorus L.*	*
Poaceae	*Paspalidium albovillosum S.T.Blake*	LC
Poaceae	*Paspalidium caespitosum C.E.Hubb.*	LC
Poaceae	*Paspalidium criniforme S.T.Blake*	LC
Poaceae	*Paspalidium gracile (R.Br.) Hughes*	LC
Poaceae	*Paspalum mandiocanum Trin.*	*
Passifloraceae	*Passiflora foetida L.*	*
Peltulaceae	*Peltula placodizans (Zahlbr.) Wetmore*	LC
Polygonaceae	*Persicaria lapathifolia (L.) Gray*	LC
Proteaceae	*Persoonia amaliae Domin*	LC
Proteaceae	*Persoonia falcata R.Br.*	LC
Caesalpiniaceae	*Petalostylis labicheoides R.Br.*	LC
Rutaceae	*Phebalium glandulosum Hook. subsp. glandulosum*	LC
Phyllanthaceae	*Phyllanthus*	LC
Phyllanthaceae	*Phyllanthus carpentariae Muell.Arg.*	LC
Phyllanthaceae	*Phyllanthus fuernrohrii F.Muell.*	LC
Pittosporaceae	*Pittosporum spinescens (F.Muell.) L.Cayzer, Crisp & I.Telford*	LC
Sapotaceae	*Planchonella cotinifolia var. pubescens P.Royen*	LC
Sapotaceae	*Planchonella pohlmaniana (F.Muell.) Pierre ex Dubard*	LC
Sapotaceae	*Planchonella pohlmaniana var. (Gilbert River C.T.White 1409)*	LC
Anacardiaceae	*Pleiogynium timorense (DC.) Leenh.*	LC
Asteraceae	*Pluchea dentex R.Br. ex Benth.*	LC
Polygalaceae	*Polygala pycnantha R.A.Kerrigan*	LC
Trichotheliaceae	*Porina subargillacea Muell.Arg.*	LC
Mimosaceae	*Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth*	*
Lamiaceae	*Prostanthera collina Domin*	LC
Acanthaceae	*Pseuderanthemum variabile (R.Br.) Radlk.*	LC
Poaceae	*Pseudoraphis paradoxa (R.Br.) Pilg.*	LC
Rubiaceae	*Psydrax saligna S.T.Reynolds & R.J.F.Hend. forma saligna*	LC
Asteraceae	*Pterocaulon serrulatum (Montrouz.) Guillaumin var. serrulatum*	LC
Ptychomitriaceae	*Ptychomitrium muelleri (Mitt.) A.Jaeger*	LC
Ramalinaceae	*Ramalinora glaucolivida (Muell.Arg.) Lumbsch, Rambold & Elix*	LC
Myrtaceae	*Rhodamnia pauciovulata Guymer*	LC
Rubiaceae	*Richardia brasiliensis Gomes*	*
Acanthaceae	*Rostellularia adscendens (R.Br.) R.M.Barker*	LC
Chenopodiaceae	*Salsola australis R.Br.*	LC
Santalaceae	*Santalum lanceolatum R.Br.*	LC
Poaceae	*Sarga plumosum (R.Br.) Spangler*	LC
Poaceae	*Schizachyrium fragile (R.Br.) A.Camus*	LC
Cyperaceae	*Schoenoplectiella dissachantha (S.T.Blake) Lye*	LC
Chenopodiaceae	*Sclerolaena tetracuspis (C.T.White) A.J.Scott*	LC
Plantaginaceae	*Scoparia dulcis L.*	*
Poaceae	*Sehima nervosum (Rottler) Stapf*	LC

Family Name	Botanical Name	NC Act Status[1]
Asteraceae	*Senecio brigalowensis I.Thomps.*	LC
Caesalpiniaceae	*Senna artemisioides subsp. coriacea (Benth.) Randell*	LC
Caesalpiniaceae	*Senna costata (J.F.Bailey & C.T.White) Randell*	LC
Poaceae	*Setaria oplismenoides R.A.W.Herrm.*	LC
Poaceae	*Setaria paspalidioides Vickery*	LC
Poaceae	*Setaria surgens Stapf*	LC
Malvaceae	*Sida*	LC
Malvaceae	*Sida aprica Domin var. aprica*	LC
Malvaceae	*Sida atherophora Domin*	LC
Malvaceae	*Sida cordifolia L.*	*
Malvaceae	*Sida fibulifera Lindl.*	LC
Malvaceae	*Sida sp. (Aramac E.J.Thompson+ JER192)*	LC
Malvaceae	*Sida sp. (Charters Towers E.J.THompson+ CHA456)*	LC
Malvaceae	*Sida spinosa L.*	*
Malvaceae	*Sida trichopoda F.Muell.*	LC
Solanaceae	*Solanum adenophorum F.Muell.*	E
Solanaceae	*Solanum galbinum A.R.Bean*	LC
Solanaceae	*Solanum parvifolium R.Br. subsp. parvifolium*	LC
Lamiaceae	*Spartothamnella puberula (F.Muell.) Maiden & Betche*	LC
Rubiaceae	*Spermacoce brachystema R.Br. ex Benth.*	LC
Asteraceae	*Sphaeromorphaea australis (Less.) Kitam.*	LC
Asteraceae	*Sphaeromorphaea subintegra A.R.Bean*	LC
Poaceae	*Sporobolus australasicus Domin*	LC
Poaceae	*Sporobolus scabridus S.T.Blake*	LC
Stereophyllaceae	*Stereophyllum radiculosum (Hook.) Mitt.*	LC
Asteraceae	*Streptoglossa adscendens (Benth.) Dunlop*	LC
Asteraceae	*Streptoglossa odora (F.Muell.) Dunlop*	LC
Fabaceae	*Stylosanthes hamata (L.) Taub.*	*
Fabaceae	*Tephrosia barbatala Bosman & A.J.P.De Haas*	LC
Fabaceae	*Tephrosia filipes Benth. subsp. filipes*	LC
Lamiaceae	*Teucrium integrifolium F.Muell.*	LC
Poaceae	*Thaumastochloa pubescens (Benth.) C.E.Hubb.*	LC
Poaceae	*Thellungia advena Stapf ex Probst*	LC
Poaceae	*Themeda triandra Forssk.*	LC
Poaceae	*Thyridolepis xerophila (Domin) S.T.Blake*	LC
Aizoaceae	*Trianthema triquetra Rottb. ex Willd.*	LC
Asteraceae	*Tridax procumbens L.*	*
Poaceae	*Triraphis mollis R.Br.*	LC
Poaceae	*Urochloa foliosa (R.Br.) R.D.Webster*	LC
Poaceae	*Urochloa mosambicensis (Hack.) Dandy*	LC
Rhamnaceae	*Ventilago viminalis Hook.*	LC
Asteraceae	*Vittadinia pustulata N.T.Burb.*	LC
Campanulaceae	*Wahlenbergia queenslandica Carolin ex P.J.Sm.*	LC

Family Name	Botanical Name	NC Act Status[1]
Parmeliaceae	*Xanthoparmelia ballingalliana Elix & J.Johnst.*	LC
Convolvulaceae	*Xenostegia tridentata (L.) D.F.Austin & Staples*	LC
Fabaceae	*Zornia dyctiocarpa var. filifolia (Domin) S.T.Reynolds & A.E.Holland*	LC
Fabaceae	*Zornia muelleriana Mohlenbr. subsp. muelleriana*	LC
Fabaceae	*Zornia muriculata Mohlenbr. subsp. muriculata*	LC
Fabaceae	*Zornia prostrata S.T.Reynolds & A.E.Holland var. prostrata*	LC
Zygophyllaceae	*Zygophyllum apiculatum F.Muell.*	LC

[1] E = Endangered, V = Vulnerable, N = Near threatened, LC = Least concern under the Queensland Nature Conservation (Wildlife) Regulation 2006
* Exotic species

Appendix D

Queensland Museum Database search results

Table D1: Queensland Museum database search results for the search area

Family	Taxon Name	Common Name	NC Act Status[1]
Amphibians			
Hylidae	*Cyclorana alboguttata*	Green-stripe Frog	LC
Hylidae	*Cyclorana brevipes*	Superb Collared-frog	LC
Hylidae	*Cyclorana novaehollandiae*	New Holland Frog	LC
Limnodynastidae	*Limnodynastes tasmaniensis*	Spotted Marshfrog	LC
Limnodynastidae	*Limnodynastes terraereginae*	Scarlet-sided Pobblebonk	LC
Limnodynastidae	*Limnodynastes sp.*		
Hylidae	*Litoria inermis*	Peters' Frog	LC
Hylidae	*Litoria latopalmata*	Broad-palmed Rocketfrog	LC
Hylidae	*Litoria rothii*	Roth's Tree-frog	LC
Hylidae	*Litoria rubella*	Naked Treefrog	LC
Limnodynastidae	*Notaden bennettii*	Holy Cross Toad	LC
Limnodynastidae	*Platyplectrum ornatum*	Ornate Burrowing Frog	LC
Myobatrachidae	*Uperoleia sp.*	Toadlet	LC
Reptiles			
Typhlopidae	*Anilios affinis*	Small-headed Blind Snake	LC
Typhlopidae	*Anilios ligatus*	Robust Blind Snake	LC
Typhlopidae	*Anilios unguirostris*	Claw-snouted Blind Snake	LC
Pythonidae	*Antaresia maculosa*	Spotted Python	LC
Elapidae	*Brachyurophis australis*	Australian Coral Snake	LC
Scincidae	*Carlia munda*	Shaded-litter Rainbow-skink	LC
Scincidae	*Carlia pectoralis*	Open-litter Rainbow-skink	LC
Agamidae	*Chlamydosaurus kingii*	Frilled Lizard	LC
Scincidae	*Cryptoblepharus adamsi*	Adam's Snake-eyed Skink	LC
Scincidae	*Cryptoblepharus sp.*	Callose-palmed Shinning-skink	LC
Scincidae	*Cryptoblepharus sp.*	Wall Skink	LC
Elapidae	*Cryptophis boschmai*	Carpentaria Snake	LC
Scincidae	*Ctenotus strauchii*	Eastern Barred Wedge-snout Ctenotus	LC
Scincidae	*Ctenotus taeniolatus*	Copper-tailed Skink	LC
Elapidae	*Demansia psammophis*	Yellow-faced Whip Snake	LC
Elapidae	*Denisonia maculata*	Ornamental Snake	V
Diplodactylidae	*Diplodactylus platyurus*	Eastern Fat-tailed Gecko	LC
Diplodactylidae	*Diplodactylus vittatus*	Stone Gecko	LC
Agamidae	*Diporiphora australis*	Tommy Round-head	LC
Scincidae	*Egernia striolata*	Tree Skink	LC
Scincidae	*Eremiascincus fasciolatus*	Narrow-banded Sand-swimmer	LC
Gekkonidae	*Gehyra catenata*	Chain-backed Dtella	LC
Gekkonidae	*Gehyra dubia*	Dubious Dtella	LC
Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko	LC
Elapidae	*Hoplocephalus bitorquatus*	Pale-headed Snake	LC

Family	Taxon Name	Common Name	NC Act Status[1]
Scincidae	*Lampropholis delicata*	Garden Skink	LC
Scincidae	*Lerista fragilis*	Eastern Mulch-slider	LC
Scincidae	*Lerista punctatovittata*	Eastern Robust Slider	LC
Pygopodidae	*Lialis burtonis*	Burton's Snake Lizard	LC
Diplodactylidae	*Lucasium steindachneri*	Box-patterned Gecko	LC
Scincidae	*Lygisaurus foliorum*	Burnett's Skink	LC
Scincidae	*Menetia greyii*	Common Dwarf Skink	LC
Scincidae	*Morethia boulengeri*	South-eastern Morethia Skink	LC
Scincidae	*Morethia taeniopleura*	North-eastern Firetail Skink	LC
Carphodactylidae	*Nephrurus asper*	Prickly Knob-tailed Gecko	LC
Diplodactylidae	*Oedura ocellata*	Ocellated Velvet Gecko	LC
Agamidae	*Pogona barbata*	Common Bearded Dragon	LC
Scincidae	*Pygmaeascincus timlowi*	Dwarf Litter-skink	LC
Diplodactylidae	*Strophurus williamsi*	Eastern Spiny-tailed Gecko	LC
Elapidae	*Suta suta*	Myall Snake	LC
Colubridae	*Tropidonophis mairii*	Freshwater Snake	LC
Varanidae	*Varanus tristis*	Black-headed Monitor	LC
Birds			
Corvidae	*Corvus orru*	Australian Crow	LC
Strigidae	*Ninox novaeseelandiae*	Boobook Owl	LC
Mammals			
Potoroidae	*Aepyprymnus rufescens*	Rufous Bettong	LC
Peramelidae	*Isoodon macrourus*	Northern Brown Bandicoot	LC
Muridae	*Mus musculus musculus*	House Mouse	*
Petauridae	*Petaurus breviceps longicaudatus*	Sugar Glider	LC
Macropodidae	*Petrogale inornata*	Unadorned Rock-wallaby	LC
Dasyuridae	*Planigale maculata maculata*	Common Planigale	LC
Dasyuridae	*Planigale tenuirostris*	Narrow-nosed Planigale	LC
Muridae	*Pseudomys delicatulus*	Delicate Mouse	LC
Muridae	*Rattus sordidus*	Canefield rat	LC
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheath-tailed Bat	LC
Dasyuridae	*Sminthopsis macroura macroura*	Stripe-faced Dunnart	LC
Muridae	*Zyzomys argurus*	Common Rock-rat	LC

[1] E = Endangered, V = Vulnerable, N = Near threatened, LC = Least concern under the Queensland Nature Conservation (Wildlife) Regulation 2006
* Exotic species

Appendix E

BirdLife Atlas Database search results

Table E1: Birdlife Atlas database search results for the search area

Common Name	Scientific Name	NC Act Status[1]
Apostlebird	*Struthidea cinerea*	LC
Australasian Darter	*Anhinga novaehollandiae*	LC
Australasian Figbird	*Sphecotheres vieilloti*	LC
Australasian Grebe	*Tachybaptus novaehollandiae*	LC
Australasian Pipit	*Anthus novaeseelandiae*	LC
Australian Brush-turkey	*Alectura lathami*	LC
Australian Bustard	*Ardeotis australis*	LC
Australian Hobby	*Falco longipennis*	LC
Australian Magpie	*Cracticus tibicen*	LC
Australian Painted Snipe	*Rostratula australis*	V
Australian Pelican	*Pelecanus conspicillatus*	LC
Australian Raven	*Corvus coronoides*	LC
Australian Reed-Warbler	*Acrocephalus australis*	SLC
Australian Swiftlet	*Aerodramus terrareginae*	NT
Australian White Ibis	*Threskiornis molucca*	LC
Australian Wood Duck	*Chenonetta jubata*	LC
Azure Kingfisher	*Ceyx azureus*	LC
Barking Owl	*Ninox connivens*	LC
Bar-shouldered Dove	*Geopelia humeralis*	LC
Black Bittern	*Ixobrychus flavicollis*	LC
Black Honeyeater	*Sugomel niger*	LC
Black Kite	*Milvus migrans*	LC
Black Swan	*Cygnus atratus*	LC
Black-breasted Buzzard	*Hamirostra melanosternon*	LC
Black-chinned Honeyeater	*Melithreptus gularis*	NT
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	LC
Black-faced Woodswallow	*Artamus cinereus*	LC
Black-fronted Dotterel	*Elseyornis melanops*	LC
Black-necked Stork	*Ephippiorhynchus asiaticus*	LC
Black-shouldered Kite	*Elanus axillaris*	LC
Black-tailed Native-hen	*Tribonyx ventralis*	LC
Black-winged Stilt	*Himantopus himantopus*	LC
Blue-faced Honeyeater	*Entomyzon cyanotis*	LC
Blue-winged Kookaburra	*Dacelo leachii*	LC
Brolga	*Grus rubicunda*	LC
Brown Falcon	*Falco berigora*	LC
Brown Goshawk	*Accipiter fasciatus*	LC
Brown Honeyeater	*Lichmera indistincta*	LC
Brown Quail	*Coturnix ypsilophora*	LC
Brown Treecreeper	*Climacteris picumnus*	LC
Budgerigar	*Melopsittacus undulatus*	LC
Bush Stone-curlew	*Burhinus grallarius*	LC

Common Name	Scientific Name	NC Act Status[1]
Cattle Egret	*Ardea ibis*	SLC
Channel-billed Cuckoo	*Scythrops novaehollandiae*	LC
Chestnut-breasted Mannikin	*Lonchura castaneothorax*	LC
Cicadabird	*Coracina tenuirostris*	LC
Cockatiel	*Nymphicus hollandicus*	LC
Common Bronzewing	*Phaps chalcoptera*	LC
Common Greenshank	*Tringa nebularia*	SLC
Crested Pigeon	*Ocyphaps lophotes*	LC
Crow & Raven species		LC
Diamond Dove	*Geopelia cuneata*	LC
Dollarbird	*Eurystomus orientalis*	LC
Double-barred Finch	*Taeniopygia bichenovii*	LC
Dusky Moorhen	*Gallinula tenebrosa*	LC
Eastern Barn Owl	*Tyto javanica*	LC
Eastern Great Egret	*Ardea modesta*	SLC
Eastern Koel	*Eudynamys orientalis*	LC
Emu	*Dromaius novaehollandiae*	LC
Eurasian Coot	*Fulica atra*	LC
Fairy Martin	*Petrochelidon ariel*	LC
Forest Kingfisher	*Todiramphus macleayii*	LC
Fork-tailed Swift	*Apus pacificus*	SLC
Galah	*Eolophus roseicapillus*	LC
Golden-headed Cisticola	*Cisticola exilis*	LC
Great Bowerbird	*Ptilonorhynchus nuchalis*	LC
Grey Butcherbird	*Cracticus torquatus*	LC
Grey Fantail	*Rhipidura albiscapa*	LC
Grey Goshawk	*Accipiter novaehollandiae*	LC
Grey Shrike-thrush	*Colluricincla harmonica*	LC
Grey Teal	*Anas gracilis*	LC
Grey-crowned Babbler	*Pomatostomus temporalis*	LC
Ground Cuckoo-shrike	*Coracina maxima*	LC
Hardhead	*Aythya australis*	LC
Horsfield’s Bushlark	*Mirafra javanica*	LC
Horsfield's Bronze-Cuckoo	*Chalcites basalis*	LC
House Sparrow	*Passer domesticus*	LC
Intermediate Egret	*Ardea intermedia*	LC
Jacky Winter	*Microeca fascinans*	LC
Laughing Kookaburra	*Dacelo novaeguineae*	LC
Leaden Flycatcher	*Myiagra rubecula*	LC
Letter-winged Kite	*Elanus scriptus*	LC
Little Black Cormorant	*Phalacrocorax sulcirostris*	LC
Little Crow	*Corvus bennetti*	LC
Little Eagle	*Hieraaetus morphnoides*	LC

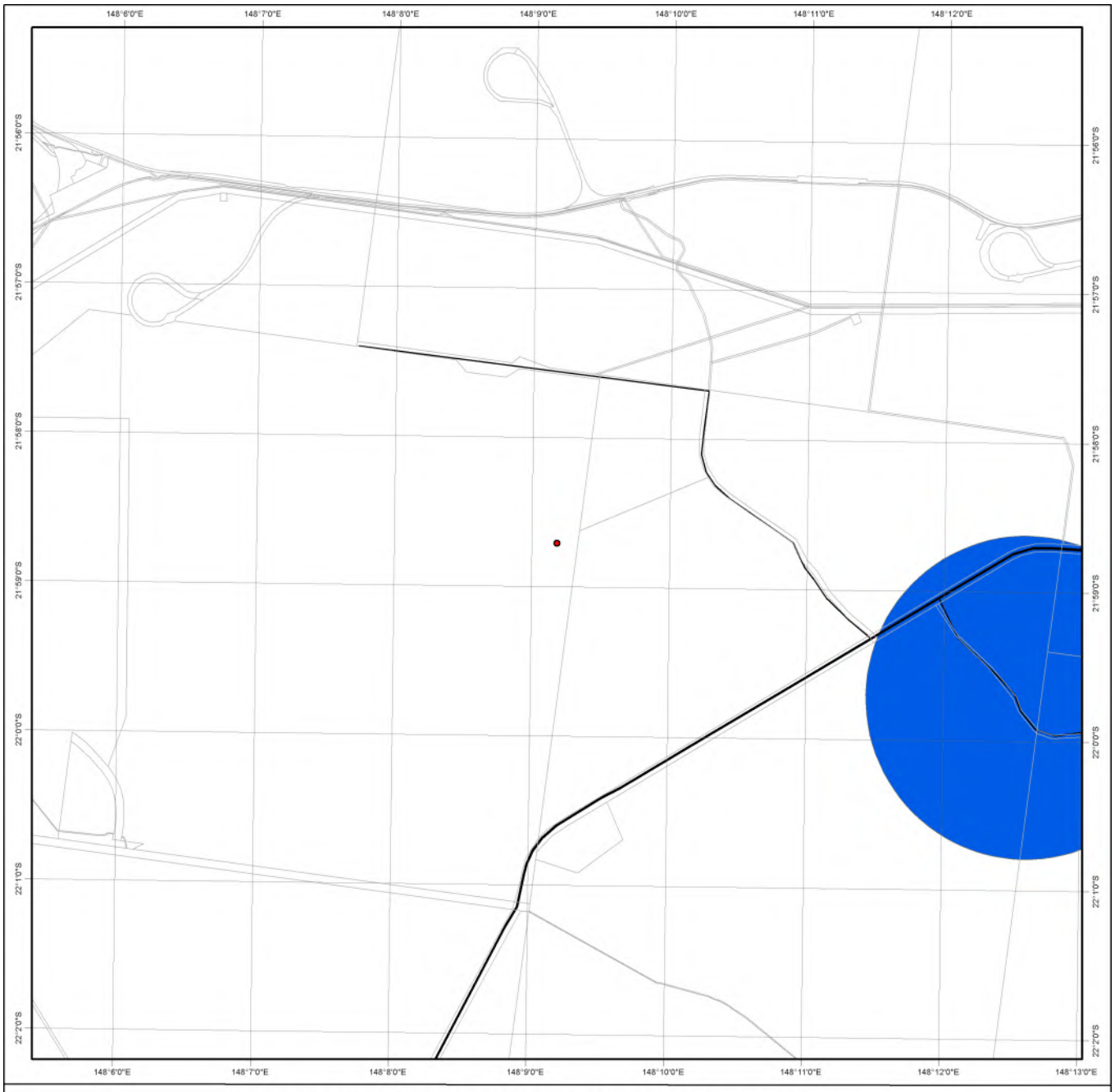
Common Name	Scientific Name	NC Act Status[1]
Little Egret	*Egretta garzetta*	LC
Little Friarbird	*Philemon citreogularis*	LC
Little Pied Cormorant	*Microcarbo melanoleucos*	LC
Little Woodswallow	*Artamus minor*	LC
Magpie-lark	*Grallina cyanoleuca*	LC
Masked Lapwing	*Vanellus miles*	LC
Mistletoebird	*Dicaeum hirundinaceum*	LC
Nankeen Kestrel	*Falco cenchroides*	LC
Noisy Friarbird	*Philemon corniculatus*	LC
Noisy Miner	*Manorina melanocephala*	LC
Olive-backed Oriole	*Oriolus sagittatus*	LC
Pacific Baza	*Aviceda subcristata*	LC
Pacific Black Duck	*Anas superciliosa*	LC
Pale-headed Rosella	*Platycercus adscitus*	LC
Pallid Cuckoo	*Cacomantis pallidus*	LC
Peaceful Dove	*Geopelia striata*	LC
Pheasant Coucal	*Centropus phasianinus*	LC
Pictorella Mannikin	*Heteromunia pectoralis*	NT
Pied Butcherbird	*Cracticus nigrogularis*	LC
Pied Currawong	*Strepera graculina*	LC
Plumed Whistling-Duck	*Dendrocygna eytoni*	LC
Purple Swamphen	*Porphyrio porphyrio*	LC
Rainbow Bee-eater	*Merops ornatus*	LC
Rainbow Lorikeet	*Trichoglossus haematodus*	LC
Red-backed Fairy-wren	*Malurus melanocephalus*	LC
Red-backed Kingfisher	*Todiramphus pyrrhopygius*	LC
Red-capped Robin	*Petroica goodenovii*	LC
Red-winged Parrot	*Aprosmictus erythropterus*	LC
Restless Flycatcher	*Myiagra inquieta*	LC
Royal Spoonbill	*Platalea regia*	LC
Rufous Fantail	*Rhipidura rufifrons*	SLC
Rufous Songlark	*Cincloramphus mathewsi*	LC
Rufous Whistler	*Pachycephala rufiventris*	LC
Sacred Kingfisher	*Todiramphus sanctus*	LC
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	LC
Scarlet Honeyeater	*Myzomela sanguinolenta*	LC
Silvereye	*Zosterops lateralis*	LC
Singing Honeyeater	*Lichenostomus virescens*	LC
Southern Boobook	*Ninox novaeseelandiae*	LC
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	LC
Spotted Bowerbird	*Ptilonorhynchus maculatus*	LC
Squatter Pigeon	*Geophaps scripta*	V
Straw-necked Ibis	*Threskiornis spinicollis*	LC

Common Name	Scientific Name	NC Act Status[1]
Striated Pardalote	*Pardalotus striatus*	LC
Striped Honeyeater	*Plectorhyncha lanceolata*	LC
Sulphur-crested Cockatoo	*Cacatua galerita*	LC
Torresian Crow	*Corvus orru*	LC
Tree Martin	*Petrochelidon nigricans*	LC
Varied Sittella	*Daphoenositta chrysoptera*	LC
Variegated Fairy-wren	*Malurus lamberti*	LC
Wandering Whistling-Duck	*Dendrocygna arcuata*	LC
Wedge-tailed Eagle	*Aquila audax*	LC
Weebill	*Smicrornis brevirostris*	LC
Welcome Swallow	*Hirundo neoxena*	LC
Whimbrel	*Numenius phaeopus*	SLC
Whiskered Tern	*Chlidonias hybrida*	LC
Whistling Kite	*Haliastur sphenurus*	LC
White-bellied Cuckoo-shrike	*Coracina papuensis*	LC
White-breasted Woodswallow	*Artamus leucorynchus*	LC
White-browed Woodswallow	*Artamus superciliosus*	LC
White-faced Heron	*Egretta novaehollandiae*	LC
White-necked Heron	*Ardea pacifica*	LC
White-plumed Honeyeater	*Lichenostomus penicillatus*	LC
White-throated Gerygone	*Gerygone albogularis*	LC
White-throated Honeyeater	*Melithreptus albogularis*	LC
White-throated Needletail	*Hirundapus caudacutus*	SLC
White-throated Nightjar	*Eurostopodus mystacalis*	LC
White-winged Chough	*Corcorax melanorhamphos*	LC
White-winged Fairy-wren	*Malurus leucopterus*	LC
White-winged Triller	*Lalage sueurii*	LC
Willie Wagtail	*Rhipidura leucophrys*	LC
Yellow-billed Spoonbill	*Platalea flavipes*	LC
Yellow-faced Honeyeater	*Lichenostomus chrysops*	LC
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	LC
Yellow-throated Miner	*Manorina flavigula*	LC
Zebra Finch	*Taeniopygia guttata*	LC

[1] E = Endangered, V = Vulnerable, N = Near threatened, LC = Least concern, SLC - Special least concern under the Queensland Nature Conservation (Wildlife) Regulation 2006
* Exotic species

Appendix F

Protected Plants Flora Survey Trigger Map for the study area



Protected Plants Flora Survey Trigger Map

Legend

- Coordinates
- High risk area
- Cadastral line
  Property boundaries shown are provided as a locational aid only
- Freeways / motorways / highways
- Secondary roads / streets

N

0 490 980 1,470 1,960 2,450 m

This product is projected into:
GDA 1994 Queensland Albers

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Heritage Protection at palm@ehp.qld.gov.au

Disclaimer:
While every care is taken to ensure the accuracy of the data used to generate this product, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damages) and costs which might be incurred as a consequence of reliance on the data, or as a result of the data being inaccurate or incomplete in any way and for any reason.

Appendix G

Study team

Table G1: Ecology survey team for the Isaac Plains East Project

Team Member	Title	Years of experience	Qualifications	Role
Steve Marston	Principal Ecologist - EcoSM	19	BEnvEng (Hons) MWildMgt	Fauna field survey lead, reporting and review
Chris Hansen	Principal Botanist – EcoSM	15	BSc (Hons)	Flora field survey lead, reporting and review
Monica Campbell	Senior Ecologist – EcoSM	11	BSc (Hons); PhD (Plant Ecology)	Flora field survey and reporting
Mathew Warren	Ecologist – EcoSM	7	BSc (Eco)	Fauna field survey
Meredith Watherston	Principal Ecologist – EcoSM	14	BSc (Env)	Reporting and review
Laura Knowles	Principal Environmental Scientist – Hansen Bailey	17	BSc (Hons), HDipEd, MPhil (EnvSci)	Scoping, reporting, impact assessment, mitigation and report review
Kate Everding	Environmental Scientist – Hansen Bailey	18	BAppSc (Biology), GradDip EnvQual	Reporting, impact assessment, mitigation and report review

Appendix H

Commonwealth and State recommended survey guidelines

Table H1: Comparison of field survey effort with Commonwealth and State survey guidelines for listed threatened species or communities considered to potential occur in the ecology study area *

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC					
Commonwealth: • Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community (TSSC 2013a) • SPRAT Profile (DotE 2016i) ***State:*** • Guide to determining terrestrial habitat quality - A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy Version 1.1. December 2014	• It is possible to assess this ecological community and its condition at most times of the year, however timing should allow for a reasonable interval after disturbance and to enable diagnostic species to be identified	• Dry season survey was conducted in September and October 2015 in hot, dry conditions when a reduced level of observed flora species richness and plant vigour, particularly within the groundcover layer, was observed. • Exotic perennial cover could not be measured in all patches during the dry season surveys due to reduced vigour of the groundcover layer. • The post-wet season survey was completed in February 2016, following good seasonal rainfall that was sufficient to encourage	• Survey must establish key diagnostic characteristics and condition thresholds of each patch in relation to: - dominant species - corresponding regional ecosystem - disturbance history (i.e. cleared in the last 15 years) - patch size - exotic perennial plant cover (100 m x 50 m sample area).	<u>Dry-season survey</u> • Although Brigalow trees were identified in the study area during the field surveys, they did not form a dominant canopy layer and no REs representing Brigalow vegetation were found to be present. • There were non-remnant areas in the north of the study area where Brigalow was a common component of the community however, exotic perennial cover could not be measured in these patches during the dry season surveys due to reduced vigour of the groundcover layer. <u>Post-wet season survey</u> • Two survey transects (100 m x 20 m plots) were placed in one of the patches of non-remnant Brigalow in the north-eastern portion of the study	Yes

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
(EHP 2014c)		germination, regeneration and reproduction of vegetation, particularly in the groundcover species, and enable species detection, identification and cover to be measured.		area. This patch was assessed as this regenerating vegetation appeared to be older than 15 years and therefore had the potential to meet the Brigalow TEC condition criteria. Native grasses were also identified in this patch (S12 and T25). • A component of the Queensland Guide to determining terrestrial habitat quality was used to assess groundcover composition.	
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin TEC					
Commonwealth: • Listing Advice for the Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin ecological community (TSSC 2008b) • SPRAT Profile (DotE 2016j) ***State:***	• Unless exceptional circumstances apply, to maximise the assessment of condition, sites must be assessed during a good season, two months after cessation of disturbance (fire/grazing/mowing /slashing) and within two months of effective rain (TSSC 2008b).	• Dry season survey was conducted in September and October 2015 during hot, dry conditions when a low species richness and absence of annual forbs and grasses in the groundcover layer of all vegetation types throughout the project site was observed. Furthermore, the	• Survey must establish key diagnostic characteristics and condition thresholds of each patch in relation to: - Absent or sparse tree canopy (<10% projective crown cover) - Patch size (5 ha depending on condition or less for patches of	<u>Dry-season survey</u> • There were no REs identified within the study area that corresponded to the Natural Grasslands TEC (as listed in the Listing Advice for this TEC) (e.g. RE 11.8.11), and there were no natural grassland areas or communities identified that met the key diagnostic characteristics and condition thresholds for this TEC. • The dry conditions and lack of fertile material prevented	Yes

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
• Guide to determining terrestrial habitat quality - A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy Version 1.1. December 2014 (EHP 2014c)		residual groundcover vegetation was mostly 'hayed-off' and generally lacking fertile material (i.e. inflorescence). • Exotic perennial cover could not be measured in all patches during the dry season surveys due to the reduced vigour of the groundcover layer and lack of fertile material. • The post-wet season survey was completed in February 2016, following good seasonal rainfall (i.e. >300 mm in late January/early February) that was sufficient to encourage germination, regeneration and reproduction of vegetation, particularly in the groundcover species, and enable species	better condition) - Presence and diversity of indicator grass species (at least 3 species) - Tussock cover (at least 200 tussocks per quadrat) - Projected cover of woody shrubs (<50%) - Introduced species (<30% of total projected perennial plant cover). • A quadrat size of 0.1 ha should be used.	assessment being performed in areas mapped on the non-statutory Queensland Herbarium maps as potential natural grassland areas in the far north of the study area (i.e. 11.8.11). <u>Post-wet season survey</u> • Three transects were placed in the area mapped on the non-statutory Queensland Herbarium maps as potential natural grassland in the far north of the study area (Transects 1-3). • The transects consisted of a 100 m transect where a 1 m x 1 m quadrat is placed at 10 m intervals along the transect and the composition and cover of groundcover species is assessed. The number of indicator species and tussock numbers of these species was also assessed across the entire plot (i.e. 1,000 m^2).	

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
		detection, identification and cover to be measured.			
***Bertya pedicellata* (no common name)**					
State: • Flora Survey Guidelines – Protected Plants Nature Conservation Act 1992 (EHP 2014b)	• Optimal survey conditions not specified. • It is generally recommended that survey is undertaken when there is the highest possible chance of detecting the species, i.e. February – May for flowers and fruit. However, this is not a cryptic species and is readily identifiable under all seasonal conditions.	• The dry season survey was undertaken in September and October 2015 • The post-wet season survey was completed in February 2016, following good seasonal rainfall that was sufficient to encourage germination, regeneration and reproduction of vegetation, particularly in the groundcover species, and enable species detection, identification and cover to be measured. It is noted that this species is vegetatively distinct	<u>In high risk areas:</u> • Timed meander method: Continue searching the study area until no new species have been recorded for 30 minutes or when the entire area of habitat type is surveyed, whichever happens sooner. 2 meanders X <10 ha, 2-5 meanders X10-100 ha, 5 meanders X >100 ha • Voucher specimen(s) to be sent to the Queensland Herbarium OR • Transect search: Parallel transects spaced equidistant over the area (peer	<u>Dry Season Survey</u> • Areas of RE 11.7.2 were systematically searched - 2 person hours/1 day • Formal assessments undertaken in the form of three Tertiary sites and two Quaternary sites. <u>Post-wet Season Survey</u> • Areas of RE 11.7.2 were systematically searched - 2 person hours/1 day • Two of the three Tertiary sites were upgraded to Secondary sites.	• *Bertya pedicellata* was detected in the study area during the dry season surveys. • The Flora Survey Guidelines – Protected Plants only applies to surveys within a high risk area of the Guidelines' Flora Survey Trigger Map. The study area is not within a high risk area on the Flora Survey Trigger Map, therefore, these guidelines are not required to be met for this project.

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
		and can be recorded at any time of the year.	reviewed method required)		
Squatter Pigeon (southern) (*Geophaps scripta scripta*)					
Commonwealth: • Survey guidelines for Australia's threatened birds (DEWHA 2010a) • SPRAT Profile (DotE 2016k)	• Mid to late dry season (May – October, inclusive). • June is optimal for observations of juvenile birds (i.e. in breeding habitat) • Weather conditions should not be such that visual detection is impaired e.g. windy conditions or at night time • Most commonly detected between sunrise and 9 am and between 3:30 pm and sunset (particularly the first half hour and last half hour of daylight). • Inspect water features, dusty roads/tracks and other patches of	• Dry season survey was conducted October 2015 during dry conditions. Stock dams were holding water however both Smoky Creek and Billy's Gully were dry. • Post-wet season survey was conducted in March 2016 following significant rainfall in the region during late January/early February 2016 (i.e. > 300 mm). Light patchy rainfall occurred on a number of days during the fauna surveys. The rainfall did not hamper diurnal survey effort and generally led to good conditions for detecting all faunal	• Slow drive surveys along bitumen roads, dirt roads and tracks at a constant speed (20 km/hr): 2 x same route on consecutive days, including all unsealed roads and around the perimeter of the project site. Drive each route in both directions each time. • Waterbody surveys: 2 x consecutive days, including all waterbodies • Area searches or transect surveys in suitable habitat: 15 person hours/3 days • Flushing surveys or land-based area searches or line transects: 10 person	<u>Dry Season Survey:</u> • Land-based area searches (bird survey) (27 hours/8 days): 1 person hours x 4 trap sites x 5 mornings, 1 person hours x 7 supplementary sites/4 days • Sighting (active searching) (11 person hours/8 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Diurnal incidental observations: 98 person hours/7 days <u>Post-wet Season Survey:</u> • Land-based area searches (bird survey) (28 hours/7 days): 1 person hours x 4 trap sites x 5 mornings, 1 person hours x 8 supplementary sites/4 days • Sighting (active searching) (11 person hours/7 days): 1 person hours x 4 trap	In part. Flushing surveys are required by DotE, however, this survey technique was considered unnecessary for this survey as the Squatter Pigeon (southern) remains common in the broader Moranbah region. Also, previous experience in this area has shown that this species is typically recorded incidentally during surveys. The survey methods that were employed during the current surveys did result

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
	bare ground adjacent to areas of native vegetation identified as habitat.	groups. One night of spotlighting was lost due to rain. Pools of water were present in sections of Smoky Creek.	hours/3 days • Call playback is not considered useful • Survey effort is not defined for very large sites, i.e. greater than 50 ha	sites, 1 person hours x 7 supplementary sites • Diurnal incidental observations: 82 person hours/7 days	in the Squatter Pigeon (southern) being recorded within the study area (refer Figure 14), and therefore flushing surveys were not required.
State: • Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2014)	• Optimal survey conditions for individual species are not specified in Queensland Government guidelines, however, optimal time of year for vertebrate fauna surveys within the Brigalow Belt Bioregion are Spring to early Summer (September – mid-November) and Autumn (March – mid-May)	• The dry season survey was conducted in October 2015. The survey timing was consistent with the guidelines • Post-wet season survey was conducted in March 2016 following significant rainfall in the region during late January/early February 2016 (i.e. >300 mm). Light patchy rainfall occurred on a number of days during the fauna surveys. The rainfall did not hamper survey effort and generally led to good conditions for	• Diurnal bird survey: 6 x 5-10 minute area search of 100x100 m survey site • Incidental observations	<u>Dry Season Survey:</u> • Land-based area searches (bird survey) (27 hours/8 days): 1 person hours x 4 trap sites x 5 mornings, 1 person hours x 7 supplementary sites/4 days • Sighting (active searching) (11 person hours/8 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Diurnal incidental observations: 98 person hours/8 days <u>Post-wet Season Survey:</u> • Land-based area searches (bird survey) (28 hours/7 days): 1 person hours x 4 trap sites x 5 mornings, 1 person hours x 8 supplementary sites/4 days	In part. Survey techniques and effort is consistent with the guideline however, the minimum replicate sites (i.e. 3 replicate trap sites/assessment unit or habitat type) were not applied. The survey methods that were employed during the surveys did result in the Squatter Pigeon (southern) being recorded within the study area (refer Figure 14).

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
		detecting all faunal groups.		• Sighting (active searching) (11 person hours/7 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Diurnal incidental observations: 82 person hours/7 days	
Greater Glider (*Petauroides volans*)					
Commonwealth: • Survey guidelines for Australia's threatened mammals (SEWPaC 2011b) (For small and medium-sized arboreal species) *The Greater Glider was not a listed threatened species at the time of the surveys for this project, and specific survey guidelines and the species SPRAT profile were not available.*	• Survey at dusk and during the night • Very windy or rainy nights should be avoided as these conditions can reduce fauna activity and detectability of fauna	• The dry season survey was consistent with these conditions with no rainfall experienced during the dry season fauna survey • The post wet season survey was conducted during a wet period where patchy light showers occurred on a number of days and one night of spotlighting was cancelled due to rain.	• Daytime searches of potentially suitable habitat resources for den sites and food trees and other signs (feeding, scratches on tree trunks): approx. 50-100 m interval transects over 2 hours/per hectare in a 5 ha site. Stratify for large sites • Direct daytime searches: ≥4 x 100 m transects/5 ha. Stratify for large sites • Stag watching at dusk: 30 mins before and 60 mins	<u>Dry Season Survey:</u> • Active searching – sightings and signs (11 person hours/8 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Spotlighting (26 person hours/8 days): 1.5 person hours x 4 trap sites, 1.5 person hours x 5 supplementary sites, 1 person hour x 2 supplementary site and 10.5 person hours from a slow moving vehicle • Nocturnal incidental observations: 50 person hours/5 days <u>Post-wet Season Survey</u>	*It should be noted that the Greater Glider was not a listed threatened species at the time of the field surveys for this project, and therefore surveys specifically targeting this species were not conducted. However, the search effort undertaken for the project is considered to meet relevant survey guidelines in part.*

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
			after dusk • Spotlighting along transects, tracks or roads: ≥2 x 200 m transects/5 ha on foot over ≥2 nights. Stratify for large sites • Call detection/call playback of the species and predatory owls: 2 sites/stratification unit up to 200 ha duplicated over 2 separate nights, in conjunction with stag watching • Arboreal cage traps if necessary: 10 traps per site, ≥2 sites/5 ha, over 4 consecutive nights (i.e. 80 trap nights). Stratify for large sites	• Active searching – sightings and signs (11 person hours/7 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Spotlighting (18.5 person hours/7 days): 1 person hours x 4 trap sites, 1 x person hour x 5 supplementary sites and 9.5 person hours from a slow moving vehicle • Nocturnal incidental observations: 40 person hours/5 days	Although stag watching and cage traps were not used, the survey methods and effort used during the field surveys resulted in detection of this species (refer Figure 15).
Koala (*Phascolarctos cinereus*)					
Commonwealth: • EPBC Act referral guidelines for the	• Direct observation methods: between August-January.	• Dry season survey was conducted in October 2015 during	• Faecal pellet searches using Spot Assessment Technique (SAT),	<u>Dry Season Survey:</u> • Diurnal Koala strip transects (11 transects	Yes. Koala strip transects were

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DotE 2014) • SPRAT Profile (DotE 2016f)	• Account for seasonal considerations. • Inland areas: Direct observation methods conducted during dry periods should concentrate on riparian areas, upper/mid-slope areas and other dry-period refugia.	dry conditions. • Post-wet season survey was conducted in March 2016 following significant rainfall in the region during February 2016. Light patchy rainfall occurred on a number of days during the fauna survey. The rainfall did not hamper survey effort and generally led to good conditions for detecting all faunal groups.	particularly for drier sites • Diurnal strip transect searches (<30 ha) • Nocturnal spotlighting • Call playback • Remote sensor activated cameras • Survey effort not specified – site and habitat specific	totalling 92.8 ha) • Call playback (11 sessions): 1 person hour x 4 trap sites, 1 person hour x 7 supplementary sites/4 nights. • Spotlighting (26 person hours/8 days): 1.5 person hours x 4 trap sites, 1.5 person hours x 5 supplementary sites, 1 person hour x 2 supplementary site and 10.5 person hours from a slow moving vehicle • Active searching – sightings and signs (11 person hours/8 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Infra-red camera (191 trap nights): 1 camera x 4 trap sites x 4 nights, 1 camera x 5 supplementary sites x 35 nights • Diurnal incidental observations: 98 person hours /8 days • Nocturnal incidental observations: 50 person	conducted which covered approximately 104.2 ha (27%) of suitable habitat present in the study area, nocturnal spotlighting, call playback and remote sensor activated cameras were used.

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
				hours/8 days <u>Post-wet Season Survey</u> • Diurnal Koala strip transects (1 transect totalling 11.4 ha) • Call playback (9 sessions): 1 person hour x 4 trap sites, 1 person hour x 5 supplementary sites/4 nights. • Spotlighting (18.5 person hours/7 days): 1 person hour x 4 trap sites, 1 person hour x 5 supplementary sites, and 9.5 person hours from a slow moving vehicle • Active searching – sightings and signs (11 person hours/7 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Infra-red camera (64 trap nights): 1 camera x 4 trap sites x 4 nights • Diurnal incidental observations: 82 person hours /7 days • Nocturnal incidental	

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
				observations: 40 person hours/5 days	
State: • Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2014)	• Optimal survey conditions for individual species are not specified in Queensland Government guidelines, however, optimal time of year for vertebrate fauna surveys within the Brigalow Belt Bioregion are Spring to early Summer (September – mid-November) and Autumn (March – mid-May)	• The dry season survey was conducted in October 2015. The survey timing was consistent with the guidelines • Post-wet season survey was conducted in March 2016 following significant rainfall in the region during February 2016. Light patchy rainfall occurred on a number of days during the fauna survey. The rainfall did not hamper survey effort and generally led to good conditions for detecting all faunal groups.	• Line transects: (no minimum number stipulated for large sites) • Call playback: 2 sessions at each systematic site • Spotlighting: 2 x 30 minute search per site • Scat and sign searches: search each systematic site and incidentally • Incidental observations	<u>Dry Season Survey:</u> • Diurnal Koala strip transects (11 transects totalling 92.8 ha) • Call playback (11 sessions): 1 person hour x 4 trap sites, 1 person hour x 7 supplementary sites/4 nights. • Spotlighting (26 person hours/8 days): 1.5 person hours x 4 trap sites, 1.5 person hours x 5 supplementary sites, 1 person hour x 2 supplementary site and 10.5 person hours from a slow moving vehicle • Active searching – sightings and signs (11 person hours/8 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Infra-red camera (191 trap nights): 1 camera x 4 trap sites x 4 nights, 1 camera x 5 supplementary sites x 35	Yes. Koala strip transects were conducted which covered approximately 104.2 ha (27%) of suitable habitat present in the study area, call playback (one session at each systematic site), spotlighting, scat and sign searches and incidental observations were used. Remote sensor activated cameras were also installed.
• Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 (Policy 4)	• Not specified		• Actual animal sightings preferred, rather than indirect methods of detection • For sites >50 ha: - Sampling transects to be uniformly positioned across the site at a constant compass		

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
			bearing so as to survey a cross section of vegetation / habitat types - Transect to comprise a number of observers walking 15 m apart walking a fixed compass bearing, all maintaining the same pace - Each tree in transect to be searched and data collected for all Koalas sighted - Supplemented with indirect means of detection (i.e. scratches or faecal pellets).	nights • Diurnal incidental observations: 98 person hours /8 days • Nocturnal incidental observations: 50 person hours /8 days <u>Post-wet Season Survey</u> • Diurnal Koala strip transects (1 transect totalling 11.4 ha) • Call playback (9 sessions): 1 person hour x 4 trap sites, 1 person hour x 5 supplementary sites/4 nights. • Spotlighting (18.5 person hours/7 days): 1 person hour x 4 trap sites, 1 person hour x 5 supplementary sites, and 9.5 person hours from a slow moving vehicle • Active searching – sightings and signs (11 person hours/7 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Infra-red camera (64 trap nights): 1 camera x 4 trap	

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
				sites x 4 nights • Diurnal incidental observations: 82 person hours /7 days • Nocturnal incidental observations: 40 person hours /5 days	
Short-beaked Echidna (*Tachyglossus aculeatus*)					
State: • Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2014)	• Optimal survey conditions for individual species are not specified in Queensland Government guidelines, however, optimal time of year for vertebrate fauna surveys within the Brigalow Belt Bioregion are Spring to early Summer (September – mid-November) and Autumn (March – mid-May)	• The dry season survey was conducted in October 2015. The survey timing was consistent with the guidelines • Post-wet season survey was conducted in March 2016 following significant rainfall in the region during February 2016. Light patchy rainfall occurred on a number of days during the fauna survey. The rainfall did not hamper survey effort and generally led to good conditions for	• Required survey intensity of ≥3 replicate fauna trapping sites in each habitat type. The following is required at each site: - Diurnal active searching: 2 x 30 person minutes of two different 50x50 m areas - Nocturnal active searching: 2 x 30 person-minutes searches of 100x100 m area - Spotlighting: 2 x 30 person-minutes searches of 100x100 m	<u>Dry Season Survey:</u> • Active searching – sightings and signs (11 person hours/8 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Spotlighting (26 person hours/8 days): 1.5 person hours x 4 trap sites, 1.5 person hours x 5 supplementary sites, 1 person hour x 2 supplementary site and 10.5 person hours from a slow moving vehicle • Infra-red camera (191 trap nights): 1 camera x 4 trap sites x 4 nights, 1 camera x 5 supplementary sites x 35 nights • Diurnal incidental	In part. Survey techniques and effort is consistent with the guideline however, the minimum replicate sites (i.e. 3 replicate trap sites/assessment unit or habitat type) were not applied. Despite this, the survey methods and effort used during the field surveys resulted in detection of this species.

Survey Guidelines	Optimal Survey Conditions noted in Guidelines	Actual Survey Conditions	Recommended Survey Techniques and Survey Effort from Guidelines	Actual Survey Techniques and Effort Undertaken	Compliance with Guidelines
		detecting all faunal groups.	area - Scat and sign search: each survey site and incidentally - Incidental observations	observations: 98 person hours /8 days • Nocturnal incidental observations: 50 person hours /8 days <u>Post-wet Season Survey:</u> • Active searching – sightings and signs (11 person hours/7 days): 1 person hours x 4 trap sites, 1 person hours x 7 supplementary sites • Spotlighting (18.5 person hours/7 days): 1 person hour x 4 trap sites, 1 person hour x 5 supplementary sites, and 9.5 person hours from a slow moving vehicle • Infra-red camera (64 trap nights): 1 camera x 4 trap sites x 4 nights • Diurnal incidental observations: 82 person hours /7 days • Nocturnal incidental observations: 40 person hours /5 days	

1 Minimum survey effort is not defined for very large sites, i.e. survey effort is based on 50 ha sites for birds.
* Table H1 includes only those species and ecological communities, which were determined as having a moderate or high likelihood of occurrence within the study area prior to the commencement of the field surveys (refer to Sections 3.3.9, 4.3, 4.4 and 6.4 of the main report).

Appendix I

Assessment of likelihood for significant flora species to occur in the study area

Table I1: Significant flora identified from database searches for the search area

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
Bertya pedicellata (no common name)	NL	NT	Wildlife Online, HERBRECS	***Distribution:*** This species is confined to central and south-east Queensland, from near Aramac to Rockhampton and south to near Biggenden. There is an isolated record from the Warwick district (CSIRO 2015a). ***Habitat preferences:*** This species typically grows on rocky hillsides in eucalypt forests or woodlands, *Acacia* woodlands or shrublands, and open heathland or vine thicket communities (CSIRO 2015a EHP 2014d). It is known to occur in skeletal to shallow sandy, sandy clay or clay loams overlaying rhyolite, trachyte or sandstone substrates. Associated species include *Corymbia trachyphloia*, *Dodonaea filifolia*, Acacia catenulata, *A. curvinervia*, *A. shirleyi*, *A. rhodoxylon*, *A. sparsiflora*, *Eucalyptus crebra*, *A. harpophylla* and *E. decorticans* (CSIRO 2015a). ***Notable features:*** An extensively branched shrub growing to 6 m tall (EHP 2014d). ***Dispersal mode:*** Unknown – seeds have never been seen (Bean, 1997). ***Nearest record:*** The nearest record is approximately 3 km south-east of the study area (Queensland Herbarium 2015c).	**Present:** Three small populations of this species were recorded in the study area during the flora surveys. All three populations were recorded on the edge of a lateritic jump-up, characterised by skeletal pale brown- grey sandy soils and lateritic rubble supporting fragmented Lancewood (*Acacia shirleyi*) shrubland to low woodland with emergent eucalypts (i.e. RE 11.7.2). Targeted traverses of this vegetation type were undertaken throughout the study area. To date no large populations have been recorded.
Cerbera dumicola (no common name)	NL	NT	Wildlife Online, HERBRECS	***Distribution:*** Coastal and sub-coastal central Queensland (Society for Growing Australia Plants 2007). ***Habitat preferences:*** This species grows mostly in Lancewood scrubs but has been recorded in eucalypt woodland and open forest (DEHP 2015). This species tends to be associated with lateritic jump-up features in	**Low:** Regional Ecosystem mapping indicates lateritic jump-ups are present and these may provide suitable habitat for this species. However, this is a very

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				the landscape (C. Hansen personal observations of numerous populations in central Queensland). ***Notable features:*** This is a latex producing shrub that can grow to 4 m (Fletcher 2001). Flowering has been recorded from March to November and fruiting from August to November (EHP 2013). ***Dispersal mode:*** Vertebrate dispersed – fleshy fruited drupe. Water dispersed – woody endocarp assists floatation. ***Nearest record:*** The nearest record is approximately 13 km north of the study area (Queensland Herbarium 2015c).	distinctive species with bright green foliage that seems more aligned with a tropical plant but can be deciduous during extended periods of no rainfall. No specimens were recorded within suitable habitats (i.e. lateritic jump-ups and adjacent eucalypt woodland and forest) in the study area during the flora surveys.
Marlborough Blue (*Cycas ophiolitica*)	E	E	PMST	***Distribution:*** It occurs from Marlborough to Rockhampton and Mt Morgan. ***Habitat preferences:*** This species occurs on hills and slopes in open forests and woodlands at altitudes between 80-400 m above sea level. It grows on a range of soils but appears to grow best on red clay soils derived from serpentinite (DotE 2015c Melzer et al. 2007). Associated species include *Corymbia dallachiana*, *C. erythrophloia*, *C. xanthope* and *Eucalyptus fibrosa*. This species has also been recorded with *Corymbia dallachiana*, *C. erythrophloia* and *E. crebra* on mudstone and with *Corymbia intermedia*, *E. drepanophylla* and *E. tereticornis* on alluvial loams (DotE 2015c). ***Notable features:*** This is a large distinctive cycad species. This cycad has a broad, crowded crown and bluish leaflets (DotE 2015c). ***Seed dispersal:*** This is limited for this species and mainly through mammals such as possums, rodents or fruit bats (DotE 2015c).	**Low:** Underlying geology and landform is unlikely to support this species. This is a distinctive species that was not recorded within the study area during the flora surveys.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				Dispersal mode: Gravity dispersed; some evidence of dispersal by vertebrates, but seeds are toxic (Queensland Herbarium, 2007). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	
Dichanthium queenslandicum (King Blue-grass)	E	V	Wildlife Online, PMST, HERBRECS	***Distribution:*** This species is known from three disjunct populations: 1) Hughenden district, 2) Nebo to Monto and west to Clermont and Rolleston, and 3) Dalby district. ***Habitat preferences:*** This grass is confined to natural tussock grassland areas on heavy black cracking clay soils. It mainly occurs in association with other species of blue grasses (i.e. *Dichanthium* spp. and *Bothriochloa* spp.). It is strongly associated with the natural bluegrass grasslands of central and southern Queensland, including the EPBC Act listed natural grassland ecological communities (TSSC 2013c). Recorded only from well-managed and conservatively grazed properties (Fletcher 2001 Sharp and Simon 2002). ***Notable features:*** A grass growing to 80 cm in height. ***Dispersal mode:*** Wind and mammal dispersed – awned seeds assist with wind movement and attachment to mammals. ***Nearest record:*** The nearest record is approximately 14 km south of the study area (Queensland Herbarium 2015c).	**Low:** Non-statutory mapping by the Queensland Herbarium indicates that *Dichanthium sericeum* grassland (i.e. RE 11.8.11) may occur in the northern portion of the study area. This grassland RE has been known to also contain *Dichanthium queenslandicum.* However, field surveys found these areas to be heavily degraded and dominated by Buffel Grass (**Pennisetum ciliaris*) and Parthenium Weed (**Parthenium hysterophorus*). *Dichanthium queenslandicum* was not recorded within the study area during the flora surveys, despite being targeted during appropriate seasonal conditions. It is therefore considered to have a low likelihood of being present due to the lack of habitat of suitable quality.
Dichanthium setosum (no	V	LC	Wildlife Online, PMST,	***Distribution:*** This grass species is known from inland New South Wales and Queensland. In Queensland the	**Low:** Non-statutory mapping by the Queensland Herbarium

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
common name)			HERBRECS	species has been recorded in the Leichardt, Morton, North Kennedy and Port Curtis regions. ***Habitat preferences:*** It grows on heavy basaltic black soils and red-brown loams with clay subsoil. It is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnant and highly disturbed pasture (DotE 2015d). ***Notable features:*** This is a perennial grass that commences growing in spring, flowers in summer and becomes dormant in late autumn (DotE 2015d). ***Dispersal mode:*** Wind and mammal dispersed – awned seeds assist with wind movement and attachment to mammals. ***Nearest record:*** The nearest record is approximately 26 km north-west of the study area (Queensland Herbarium 2015c).	indicates that *Dichanthium sericeum* grassland (i.e. RE 11.8.11) may occur in the northern portion of the study area. This grassland RE has been known to also contain *Dichanthium setosum.* However, field surveys found these areas to be heavily degraded and dominated by Buffel Grass and Parthenium Weed. *Dichanthium setosum* was not recorded within the study area during the flora surveys, despite being targeted during appropriate seasonal conditions. It is therefore considered to have a low likelihood of being present due to the lack of habitat of suitable quality.
Black Ironbox (*Eucalyptus raveretiana*)	V	LC	PMST	***Distribution:*** This species occurs as scattered and disjunct populations in central coastal and sub-coastal Queensland, from Dipperu National Park southwest of Mackay, north to Charters Towers, Bowen and Ayr, in and 100 km around Rockhampton and near the Mackenzie River north of Duaringa. It is known from 23 main locations and there are many more sub-populations (Brooker and Kleinig 2008 DotE 2015e) ***Habitat preferences:*** This eucalypt occurs on the banks of rivers, creeks and moderate sized watercourses on	**Low:** As this species hasn't been recorded in close proximity to the study area it is unlikely to be present. The watercourses in the project site were traversed in their entirety. This is a distinctive species that was not recorded within the study area during the flora

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				clayey or sandy loam and is often associated with White Paperbark (*Melaleuca leucadendra*) and/or Weeping Paperbark (*M. fluviatilis*) fringing open forest in coastal streams where it tends to displace Queensland Blue Gum (*E. tereticornis*) as the emergent eucalypt species (TSSC 2008c). It is known to occur at an altitudinal range between 1-300 m in areas with annual rainfall between 650-1100 m (DotE 2015e). ***Notable features:*** This is a large eucalypt with the smallest fruit of any eucalypt (DotE 2015e). ***Dispersal mode:*** Gravity, wind and/or water dispersed – no specific morphological features that aid secondary dispersal. Ants may also disperse seeds. ***Nearest record:*** This species has not been recorded within 25 km of the study area.	surveys.
Kelita uncinella (no common name)	NL	E	Wildlife Online, HERBRECS	***Distribution:*** This species is known from central Queensland. ***Habitat preferences:*** This species has been recorded growing in red gravelly skeletal soils, on steep slopes in semi-evergreen vine thicket, also in *Acacia shirleyi* woodland with a sparse semi-evergreen vine thicket understorey on a stony ridge (CSIRO 2015b). ***Dispersal mode:*** Fruit approximately 1.5 mm diameter excluding style, 1-seeded, thick-walled, and indehiscent. The sepals and the fruit capsule remain firmly attached to each other in the aging flower and together form the propagule, which readily detaches from the bract and bracteoles. Gravity, wind and/or water dispersed but also potentially transported on animal fur (Bean, 2010) ***Nearest record:*** The nearest record of this species is approximately 18 km to the north-east of the study area	**Low:** Although potential Lancewood woodland habitat is present in the study area, this vegetatively distinct species was not recorded despite extensive targeted searches during both flora survey periods.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				(Queensland Herbarium 2015c).	
Samadera bidwillii (no common name)	V	V	PMST	***Distribution:*** This species is known from a number of locations between Scawfell Island, near Mackay and Goomboorian, north of Gympie. It occurs in the Burnett Mary, Fitzroy, Mackay Whitsunday and Burdekin Natural Resource Management regions. ***Habitat preferences:*** It occurs in lowland rainforest or on rainforest margins as well as open forest and woodland communities. It is often found adjacent to temporary or permanent watercourses up to 510 m in altitude. A number of eucalypts are commonly associated with this species (TSSC 2008d). It grows on lithosols, skeletal soils, loam soils, sands, silts and sands with clay subsoils (DotE 2015f). ***Notable features:*** It bears red fruits and flowers from November to March (TSSC 2008d). ***Dispersal mode:*** Gravity, wind and/or water dispersed – no specific morphological features that aid secondary dispersal. Ants may also disperse seeds. ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** There are no known records in close proximity to the study area. Habitat is unlikely to be suitable for this species. This is a distinctive species that was not recorded within the study area during the flora surveys.
Solanum adenophorum (no common name)	NL	E	Wildlife Online, HERBRECS	***Distribution:*** This species is known from the Dingo-Nebo-Clermont area in Queensland (CSIRO 2015c). ***Habitat preferences:*** It occurs in deep cracking clay soils in Brigalow (*Acacia harpophylla*) and Gidgee (*Acacia cambageana*) communities (CSIRO 2015c EHP 2015a). ***Notable features:*** It flowers in October and fruits in May, September and October. ***Dispersal mode:*** Vertebrate dispersed, particularly birds – multi-seeded fleshy fruit.	**Low:** Non-statutory mapping by the Queensland Herbarium indicates that Brigalow communities may occur in the study area. This species was not recorded within the various patches of non-remnant Brigalow scrub to low woodland during the flora surveys. Cattle grazing and

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				Nearest record: The nearest record is approximately 20 km to the north-west of the study area (Queensland Herbarium 2015c).	trampling, habitat fragmentation and the dominance of Buffel Grass in the groundcover is likely to outcompete this species. Therefore, it is considered unlikely to occur within the study area.

[1] – EPBC Act Status: E = Endangered, V = Vulnerable, NL = Not listed
[2] – NC Act Status: E = Endangered, V = Vulnerable, NT = Near threatened, LC = Least concern
[3] - ALA – Atlas of Living Australia
- PMST – Protected Matters Search Tool (refer to PMST database results contained in Appendix A)
- Wildlife Online – Wildlife Online database (refer to Wildlife Online database search results contained in Appendix B)
- HERBRECS – Queensland Herbarium database (refer to HERBRECS database results contained in Appendix C)

Appendix J

Assessment of likelihood for significant fauna species to occur in the study area

Table J1: Significant fauna identified from database searches for the search area

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
Birds					
Australian Painted Snipe (*Rostratula australis*)	E	V	PMST, Birds Australia Atlas	***Distribution:*** The Australian Painted Snipe has been recorded at wetlands in all states of Australia. 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. This population is considered to occur as a single, contiguous breeding population (DotE 2015g). ***General habitat preferences:*** This secretive, cryptic, crepuscular (active at dawn, dusk and during the night) species occurs in terrestrial shallow wetlands, both ephemeral and permanent, usually freshwater but occasionally brackish. They also use inundated grasslands, salt-marsh, dams, rice crops, sewage farms and bore drains with rank emergent tussocks of grass, sedges, rushes or reeds or samphire, and often with scattered clumps of Lignum (*Muehlenbeckia florulenta*), canegrass or sometimes tea trees. It has been known to use areas lined with trees, or that have some scattered fallen or washed-up timber (DotE 2015g). ***Foraging habitat:*** The species feeds on vegetation, seeds, and invertebrates including crustaceans and molluscs as well as insects, worms and other invertebrates (DotE 2015g Marchant and Higgins 1994). Foraging habitats are not well understood (DotE 2015g). ***Breeding habitat:*** Requirements are specific and include shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Almost all records of nests occur on or near small islands in freshwater wetlands characterised by a combination of very shallow	**Low:** Suitable wetland habitat for this species is not present in the study area. This species was not recorded within the study area during the fauna surveys.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				water, exposed mud, dense low cover and sometimes some tall dense cover. Although this species uses modified habitat, it doesn't necessarily breed in these habitats. It most likely breeds in response to wetland conditions rather than during a particular season (DotE 2015g). ***Notable features:*** This is a distinctive species. ***Nearest record:*** The nearest record of this species is approximately 25 km north-north-west of the study area on Goonyella Creek near the confluence with the Isaac River (BirdLife Australia 2015b).	
Curlew Sandpiper (*Calidris ferruginea*)	CE	LC	PMST	***Distribution:*** This species occurs along the coasts but is also widespread inland. In Queensland there are scattered records in the Gulf of Carpentaria, widespread records along the coast, south of Cairns, and sparsely scattered records inland. ***General habitat preferences:*** Near the coast it inhabits intertidal mudflats in sheltered areas, such as estuaries, bays inlets and lagoons and non-tidal swamps, lakes, lagoons, ponds in saltworks and sewage farms. Inland they are occasionally recorded around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They will use fresh and brackish habitats and floodwaters. ***Foraging habitat:*** This species usually wades and forages in waters 15-30 mm deep, but up to 60 mm deep at the edge of saltmarsh, emergent vegetation and inundated saltflats. It feeds on invertebrates, including worms, molluscs, crustaceans and insects, as well as seeds. ***Roosting habitat:*** The species usually roosts on bare dry shingle, shell or sand beaches, sand spits and islets and sometimes in dunes.	**Low:** Suitable wetland habitat for this species is not present in the study area. This species was not recorded within the study area during the fauna surveys.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				Notable features: This species does not breed in Australia (DotE 2016m). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	
Painted Honeyeater (*Grantiella picta*)	V	V	PMST	***Distribution:*** This species is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory. Greatest concentrations, including all breeding records, come from south of 26°, on inland slopes of the Great Dividing Range between the Grampians in Victoria and Roma in Queensland. After breeding, many birds move to semi-arid regions such as north-eastern South Australia, central and western Queensland and central Northern Territory. This species is considered to have a single population. ***General habitat preferences:*** This species occurs in mistletoes in eucalypt forests, woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, Callitris, and trees on farmland or gardens. Prefers woodlands with a higher number of mature trees, as these generally support more mistletoes. More common in larger remnant tracts, rather than narrow remnant strips. ***Breeding preferences:*** Breeding season is closely aligned with fruiting of mistletoe, therefore north-south movements have been observed (TSSC 2015). It has been known to breed in narrow roadside strips if ample mistletoe fruit is present. The species appears to prefer mistletoe as a nest substrate and is likely to be attracted to habitats where mistletoe is prevalent and parasitism rates are high (TSSC 2015). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** This species has not been recorded within 25 km of the study area. Available species records and habitat modelling (CSIRO, 2015d) indicate that the study area is outside of the known range of this species. The woodland vegetation on the study area does not support a high abundance of mistletoe to provide suitable habitat for this species. This species was not recorded within the study area during the fauna surveys.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
Red Goshawk (*Erythrotriorchis radiatus*)	V	E	PMST	***Distribution:*** This species is sparsely dispersed across coastal and sub-coastal Australia from western Kimberly Division to north-eastern New South Wales and occasionally on continental islands. ***General habitat preferences:*** This species occurs in woodlands and forests, ideally with a mosaic of vegetation types and permanent water, particularly riverine forests. The species avoids both very dense and very open habitats. They are solitary and secretive birds and hunt mainly from ambush. Their prey is mostly birds, but also mammals, reptiles and insects (Marchant and Higgins 1994). ***Breeding habitat:*** Nests are restricted to trees taller than 20 m and within 1 km of a watercourse or wetland. It is thought to rarely breed in areas with fragmented native vegetation (Garnett et al. 2011). Home ranges of 120 km2 and 200 km2 for females and males, respectively have been recorded (Marchant and Higgins 1994). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** There are no known records of this species within 25 km of the study area. While there is potential marginal habitat in the form of remnant vegetation and small watercourses in the study area, this species is more likely to occur in remnant areas associated with the larger Isaac River approximately 5 km to the west of the study area. This species was not recorded within the study area during the fauna surveys.
Squatter Pigeon (southern subspecies) (*Geophaps scripta scripta*)	V	V	Wildlife Online, PMST, Birds Australia Atlas	***Distribution:*** The southern sub-species for the Squatter Pigeon (southern subspecies) is described as occurring south of the Burdekin River-Lynd divide in the southern region of Cape York Peninsula to the Border Rivers region of northern New South Wales, and from the east coast to Hughenden, Longreach and Charleville (Higgins and Davies 1996). The known distribution of the southern sub-species overlaps with the known distribution of the northern subspecies (DotE 2016k). ***General habitat preferences:*** This species is known from tropical dry, open sclerophyll woodlands and sometimes savannah with *Eucalyptus*, *Corymbia*, *Acacia* or	**Present:** This species was recorded at several locations during the survey within remnant woodland vegetation and in cleared areas close to water (Figure 14).

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				Callitris species in the overstorey. The groundcover layer is patchy consisting of native, perennial tussock grasses or a mix of grasses and low shrubs or forbs. However, the groundcover layer rarely exceeds 33% of the ground area. It appears to favour sandy soil dissected with low gravely ridges and is less common on heavier soils with dense grass cover. It is nearly always found in close association i.e. within 3 km, with permanent water. While the species is unlikely to move far from woodland trees, where scattered trees still occur and the distance of cleared land between remnant trees or patches of habitat does not exceed 100 m, individuals may be found foraging in, or moving across modified or degraded environments (DotE 2016k). ***Foraging habitat:*** This occurs in 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. It feeds primarily on seeds of grasses, herbs and shrubs. ***Breeding habitat:*** This occurs on well-draining, stony rises occurring on sandy or gravelly soils or on low 'jump-ups' and escarpments (i.e. land zones 5 and 7), within 1 km of a suitable, permanent waterbody. ***Dispersal habitat:*** This can be any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies and may include denser patches of vegetation not suitable for foraging or breeding. ***Notable features:*** This species can breed throughout most of the year, however, peak breeding is generally April to October when the primary source of food, grass seed, is most abundant (DotE 2016k). ***Nearest record:*** This species was recorded in the study area during the fauna surveys.	

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
Star Finch (*Neochmia ruficauda ruficauda*)	E	E	PMST	***Distribution:*** In Queensland, this species' range has largely contracted to southern Cape York. There have not been any confirmed records from the Cairns to Townsville region for some time and none were recorded during the Birds Australia Atlas project. Recent records around Rockhampton are thought likely to be aviary escapees (Higgins et al. 2006). ***General habitat preferences:*** This species usually inhabits low dense damp grasslands bordering wetlands and waterways and also open savannah woodlands near water or subject to inundation but is absent from expanses of open country and uplands usually occurring in valleys (Higgins et. al. 2006). Woodland communities in which it occurs include *Eucalyptus coolabah*, *E. tereticornis*, *E. tessellaris*, *Melaleuca leucadendra*, *E. camaldulensis* and *Casuarina cunninghamii*. ***Foraging habitat:*** It feeds on grass and shrub *seeds*, most likely from *Arundinella*, *Brachyachne*, Chloris, *Chrysopogon*, *Digitaria*, *Echinochloa*, *Heterachne*, *Iselema*, *Oryza*, *Panicum*, *Setaria*, *Sorghum*, *Themeda*, *Urochloa*, *Casuarina*, *Fimbristylis* and *Tridax* species. It also feeds on insects. It has been recorded foraging, in the shade of eucalypt species, on the ground. ***Breeding habitat:*** Nests are thought to be bottle-shaped and placed in trees, amongst grass, sedges or reeds, at heights of approximately 3-9 m above the ground. ***Notable features:*** Nesting occurs in November, with eggs recorded from February to May and in September. ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** Suitable wetland, grassland and savannah woodland habitat for this species is not present in the study area and it has not been recorded within 25 km of the study area despite numerous surveys in the region. This species was not recorded within the study area during the fauna surveys.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
Mammals					
Corben's Long-eared Bat (*Nyctophilus corbeni*)	V	V	PMST	***Distribution:*** In Queensland, this species is mainly recorded in the Brigalow Belt South Bioregion, extending eastwards to the Bunya Mountains National Park, as far north as the Expedition Range and Dawson River areas and west into the Mulga Lands Bioregion and west of Bollon. ***General habitat preferences:*** Corben's Long-eared Bat occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands as well as Buloke woodland, Brigalow woodland, Belah woodland, Smooth-barked Apple (*Angophora leiocarpa*) woodland, River Red Gum (*Eucalyptus camaldulensis*) woodland and dry sclerophyll forest. It is known from habitat dominated by various eucalypt and bloodwood species and various types of tree mallee, being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer (DotE 2015h). ***Foraging habitat:*** This insectivorous bat feeds in flight, by gleaning vegetation and during ground foraging. It feeds on beetles, bugs, moths, grasshoppers, crickets, ants, spiders and mosquitoes. Foraging tends to be concentrated around patches of trees and is important for managing foliage feeding insects on eucalypt trees. ***Roosting habitat:*** Occurs solitarily under exfoliated bark an in the crevices on trees. ***Breeding habitat:*** Maternity roosts are likely to occur in colonies in larger tree cavities. Breeding is thought to occur around November, although there is little information about this (DotE 2015h). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** There are no known records within 25 km of the study area and the Moranbah region is beyond the known distribution of this species. Therefore, despite some potentially suitable woodland habitat with some dense shrub layer being present on the study area, this species is considered unlikely to occur. This species was not recorded within the study area during the fauna surveys.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
Ghost Bat (*Macroderma gigas*)	V	V	PMST	***Distribution:*** It is predicted, based on analysis of historic climatic data, fossils, and modelling that the Ghost Bat is a geographically relictual species in southern, arid landscapes, present only because caves provide suitable roost microclimates (TSSC 2016b). Although this species is thought to once occupy much of Australia, its current range is discontinuous across northern Australia, with colonies known in the Pilbara, Kimberly, northern Northern Territory, the Gulf of Carpentaria, coastal and near coastal eastern Queensland from Cape York to near Rockhampton and the Riversleigh and Cammoweal districts in western Queensland and occupying both arid and lush rainforest habitats (TSSC 2016b van Dyck and Strahan 2008a). ***General habitat preferences:*** Habitat is comprised of thicket, open woodland, and spinifex and black soil grasslands (van Dyck et al. 2013 van Dyck and Strahan 2008a). Monsoon forests, open savannah woodland, tall open forest, deciduous vine forest and tropical rainforest is also used (Churchill 2009). Cave habitat is important for roosting and breeding (van Dyck and Strahan 2008a). Ghost bats usually require a number caves to move between seasonally (TSSC 2016b). ***Foraging habitat:*** This species feeds on frogs, lizards, birds, small mammals and sometimes other bats (TSSC 2016b van Dyck and Strahan 2008a). It captures prey on the ground and then returns to an established feeding site, e.g. rock overhang or small cave, to feed (van Dyck and Strahan 2008a). It is known to forage up to 2 km from the roost cave and will use the same foraging area each night. Foraging areas are approximately 60 ha in size (Churchill 2009 TSSC 2016b). ***Roosting habitat:*** Caves provide suitable roost	**Low:** Mountainous cave and escarpment habitat does not occur in close proximity to the study area. The closest potential mountainous habitat is in the Denham Range or approximately 20 km to the north-east of the study area in the Carborough and Kerlong Ranges. There are no records of this species in close proximity to the study area. The closest known population is at least 60 km to the north-east near Mackay.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				microclimates and it is known to rest during the day in large sandstone or limestone caves, boulder piles, shallow escarpments or deep rock fissures and mines (Churchill 2009 TSSC 2016b van Dyck and Strahan 2008a). This species appears to require caves with specific temperature and humidity ranges (DSITIA 2012 TSSC 2016b). Groups of greater than 100 individuals is unusual (van Dyck and Strahan 2008a). ***Breeding habitat:*** Breeding is likely to occur in July or August with young being born between September and November. Nursery colonies are formed separately to males (van Dyck and Strahan 2008a). Only 14 breeding sites are currently known (TSSC 2016b). Young are fully weaned by about March each year but may be left in nurseries or forage with the mother up until this age (Churchill 2009). There is a tendency for breeding caves to have multiple entrances (TSSC 2016b). ***Nearest record:*** This species has not been recorded within 25 km of the study area (EHP 2015b). The nearest record in the Atlas of Living Australia from 1978, is more than 60 km to the north-east near Mackay (CSIRO 2016b).	
Greater Glider (*Petauroides volans*)	V	LC	Wildlife Online, PMST	***Distribution:*** This species is restricted to eastern Australia, between Windsor Tableland in north Queensland and Wombat State Forest in central Victoria. It occurs from sea level up to 1,200 m above sea level. Two isolated subpopulations exist in Queensland, one in the Gregory Range west of Townsville and another in the Einasleigh Uplands (TSSC 2016a). ***General habitat preferences:*** The Greater Glider occurs in a range of eucalypt-dominated habitats, including low open forests on the coast to tall forests in the ranges and	**Present:** This species was recorded at five locations in the study area along Smoky Creek and Billy's Gully (Figure 15).

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				low woodland westwards of the Dividing Range. It does not use rainforest habitats (van Dyck et al. 2013 van Dyck and Strahan 2008a). This species favours taller, montane, moist eucalypt forests with relatively old trees and abundant hollows and a diversity of eucalypt species (TSSC 2016a). ***Foraging habitat:*** The Greater Glider has an almost exclusive diet of eucalypt leaves and occasionally flowers or buds (TSSC 2016a van Dyck and Strahan 2008a). Although the species is known to feed on a range of eucalypt species, in any particular area it is likely to only forage on one or two species (van Dyck and Strahan 2008a). ***Breeding habitat:*** Breeding occurs between March and June and a single young is born each year (TSSC 2016a van Dyck and Strahan 2008a). The young stays with the mother or is left in the nest and becomes independent at about 9 months (Menkhorst and Knight 2011). ***Notable features:*** This species appears to have low dispersal ability and typically small home ranges of 1-4 ha. In lower productivity forests, home ranges may be as large as 16 ha for males. Male home ranges generally do not overlap (TSSC 2016a). It may glide over distances of up to 100 m. It is a nocturnal species and uses tree hollows during the day to rest (van Dyck and Strahan 2008a). ***Nearest record:*** This species was recorded within the study area.	
Koala (*Phascolarctos cinereus*)	V	V	Wildlife Online, PMST	***Distribution:*** This species is widespread in sclerophyll forest and woodlands on foothills and plains on both sides of the Great Dividing Range from about Chillagoe, Queensland to Mt Lofty Ranges in South Australia	**High:** The Koala was listed as occurring in the region in database searches, and in other recent EIS field surveys

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				(Menkhorst and Knight 2011). ***General habitat preferences:*** Koalas use a range of habitats, including temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species. Essentially any forest or woodland, particularly in riparian areas, containing species that are known Koala food trees, or shrubland with emergent food trees provides potential Koala habitat. Koala are known to occur in modified or regenerating native vegetation communities (DotE 2015i). ***Foraging habitat:*** The EPBC Act referral guidelines for the vulnerable Koala defines Koala food trees as those of the following genus: *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and *Melaleuca* (DotE 2014). ***Refuge habitat:*** Habitat that allows for the persistence of the Koala during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soil moisture and fertility. Such habitats occur on permanent aquifers, in riparian zones, on upper or mid-slopes, on fertile alluvial plains or where soil moisture/rainfall is reliable (DotE 2014). ***Nearest record:*** Wildlife Online search results indicate that the nearest record of this species is between 7-10 km of the study area (EHP 2015b). This species or evidence of this species has been recorded within 10 km in recent EIS field surveys undertaken in close proximity to the study area (refer Section 6.4.1).	in proximity to the study area. The Koala was not identified in the study area during surveys. The EPBC Act referral guidelines for the vulnerable Koala (DotE 2014) explain, however, that "Koalas do not necessarily have to be present" for Koala habitat to be present. The definition of Koala habitat in the referral guidelines is based on the vegetation community present and the vegetation structure. Based on the habitat definitions contained in these guidelines and the records of the species from the region, the Koala has been assessed as having a high probability of occurrence. This rating is based on: - The presence of suitable habitat within the study area in the form of woodland vegetation that contains Koala food trees; - A connection between this habitat and habitat in the region where the Koala has been recorded. - The Koala's ability to move between habitat areas,

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
					including its willingness to traverse rural landscapes, modified and disturbed areas in search of habitat (DotE 2016f).
Northern Quoll (*Dasyurus hallucatus*)	E	LC	PMST	***Distribution:*** The Northern Quoll was once widespread in Queensland but has undergone a severe range contraction and is now absent from much of its former range. ***General habitat preferences:*** This species is usually associated with dissected rocky escarpments but also known from Eucalypt forest and woodlands, around human settlement and occasionally rainforest. In the Northern Territory Northern Quoll populations are becoming extinct within one year of the arrival of the Cane Toad (**Rhinella marina*), although in Queensland some remnant quoll populations persist in areas where Cane Toads have long been present (van Dyck and Strahan 2008a). The areas where the quoll persists in Queensland tend to be steep, rocky areas, close to water that have not been recently burnt. They appear to have become extinct in many lowland habitats formerly occupied (Woinarski et al. 2008). ***Breeding habitat:*** Dens are made in rock crevices, tree holes or occasionally termite mounds (TSSC, 2005). Breeding success is higher in animals that have a den near a creek line (Braithwaite & Begg 1995). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** Suitable habitat (i.e. rocky escarpments) is not present in the study area and the species has not been recorded within 25 km of the study area despite numerous surveys in the region. This species was not recorded within the study area during the fauna surveys.
Short-beaked Echidna (*Tachyglossus aculeatus*)	NL	SLC	Wildlife Online	***Distribution:*** This species occurs throughout mainland Australia and Tasmania, as well as King, Flinders and Kangaroo Islands (Menkhorst & Knight 2011). ***General habitat preferences:*** This species occurs in	**Present**: This species was recorded from Poplar Box woodland and scats were also recorded at a number of other locations. This species occurs

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				almost all terrestrial habitats except intensively managed farmland. It shelters in logs, crevices, burrows or piles of litter and feeds on ants, termites and other soil invertebrates, particularly beetle larvae (Menkhorst and Knight 2011). ***Nearest record:*** This species was recorded in the study area during the field surveys.	in a wide range of habitats including grazing land and is likely to occur throughout the study area. However, areas of remnant vegetation are likely to be of greater habitat value for this species due to the presence of logs.
Reptiles					
Common Death Adder (*Acanthophis antarcticus*)	NL	V	Wildlife Online	***Distribution:*** This species is known from the Gulf region, central Queensland, New South Wales and southern parts of South Australia and Western Australia (Hines 2014). ***General habitat preferences***: Occurs in a variety of habitats containing deep leaf litter, including, rainforests, wet sclerophyll forests, woodland, grasslands, chenopod dominated shrublands, and coastal heathlands (Hines 2014). Habitat with deep intact leaf litter is preferred (Hines 2014 Wilson and Swann 2013). ***Foraging habitat:*** The Common Death Adder feeds on insects, frogs, small mammals, lizards and birds (Hines 2014). ***Notable features:*** During the day this snake buries itself in sand, soil or leaf litter often at the base of trees or shrubs and ambushes its prey using its tail as a lure (Cogger 2000 Hines 2014 Wilson and Swann 2013). ***Nearest record:*** This species has been recorded approximately 25 km from the study area (DSITI 2016).	**Low:** There are no areas of suitable habitat (i.e. areas that contain deep leaf litter) present in the study area, and this species has not been recorded within 25 km of the study area despite numerous surveys in the region. This species was not recorded within the study area during the fauna surveys.
Allan's Lerista (*Lerista allanae*)	E	E	PMST	***Distribution:*** This species is restricted to the area around Clermont and Capella (Borsboom et al. 2010) based on six records of this species in 2010. Prior to these records the species was thought to be potentially extinct.	**Low:** There are some small areas of land zone 8 (i.e. areas that contain suitable chocolate to dark chocolate-

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				General habitat preferences: Historically this species was known only from black soil downs (undulating plains formed on basalt, shale, sandstone and unconsolidated sediments) of the Oxford land system in the Brigalow Belt North Bioregion. Early specimens were found several centimetres under the surface of black-red soil, under tussocks of grass on farmland. Habitats include: Mountain Coolabah (*Eucalyptus orgadophila*)/Red Bloodwood (*E. erythrophloia*) open woodlands and Black Tea-tree (*Melaleuca bracteata*) closed scrub to low closed-forest gravely hills, ridges and gullies; and scattered *Bauhinia spp*. on plains (DotE 2015j). Recent records of this species are from loose friable, weakly alkaline to alkaline surface soils or leaf litter beneath trees and shrubs. Soils are described as chocolate to dark chocolate-coloured, non-cracking clay-based soils (30-65% clay content) in REs 11.8.5 and 11.8.11/11.8.5 (Borsboom et al. 2010). This species has been recorded in disturbed areas and adjacent Buffel Grass areas (Borsboom et al. 2010). ***Foraging habitat:*** This species feeds on termites. ***Breeding habitat:*** There is no life cycle information available for this species. ***Notable features:*** The absence of forelimbs and presence of a hindlimb with a single clawed digit differentiates this species from other reduced limb skinks in the region. ***Nearest record:*** This species has not been recorded within 25 km of the study area.	coloured, non-cracking clay-based soils) within the study area. However, there are no local records of this species and it is thought to be entirely restricted to an area between Clermont and Capella. The study area is approximately 110 km to the north-east of the most recent 2010 records. Prior to this the species had not been recorded since 1960 (Borsboom et al. 2010). This species was not recorded within the study area during the fauna surveys.
Dunmall's Snake (*Furina dunmalli*)	V	V	PMST	***Distribution:*** This snake occurs in the Brigalow Belt South and Nandewar bioregions from near the Queensland border south to Ashford in New South Wales. ***General habitat preferences:*** Dunmall's Snake has been found in a broad range of habitats between 200-500 m	**Low:** The study area largely lacks areas of woodland on clay or clay loam soils. In addition this species has not been recorded within 25 km

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				above sea level. Habitats including forests and woodlands on clay or clay loam soils dominated by Brigalow (*Acacia harpophylla*), other wattles such as *A. burrowii*, *A. deanii*, *A. leiocalyx*, native Cypress (*Callitris spp.*) or Bull Oak and various Spotted Gum (*Corymbia citriodora ssp. variegata*), Ironbark (*Eucalyptus crebra* and *E. melanophloia*), White Cypress Pine (*Callitris glaucophylla*) and Bull Oak open forest and woodland associations on sandstone derived soils. It has rarely been found on the edge of dry vine scrub and in hard ironstone country. It shelters under fallen timber and ground litter and may use cracks in alluvial clay soils. The Dunmall's Snake feeds on small skinks and geckos (DotE 2015k). ***Notable features:*** This is a very secretive snake with few known records. The high number of mid-body scales (21) and small yellow flecks over the temporal region and lips will generally distinguish this snake from other similar species. ***Nearest record:*** This species has not been recorded within 25 km of the study area.	of the study area. This species was not recorded within the study area during the surveys.
Ornamental Snake (*Denisonia maculata*)	V	V	Wildlife Online, PMST, Queensland Museum	***Distribution:*** This snake species is known from the Brigalow Belt North and parts of the Brigalow Belt South Bioregions, with the main occurrences in the drainage system of the Fitzroy and Dawson Rivers. ***General habitat preferences:*** This snake is found in close association with frogs which form the majority of its prey. It is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions with clay soils but is also known from lake margins, wetlands and waterways. This species has been recorded mostly in Brigalow (*Acacia harpophylla*), Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*) or Coolabah (*Eucalyptus coolabah*)	**Present:** This species was identified at one location in the study area (Figure 16). However, the study area lacks gilgai or wetland areas that form the preferred habitat for this species. The level of disturbance to vegetation fringing the waterways reduces the potential of these areas to provide suitable habitat for this species.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				- dominated vegetation communities or pure grassland associated with gilgais. REs in which it has been recorded include; 11.4.3, 11.4.6, 11.4.8 and 11.4.9 and 11.3.3 and 11.5.16. It shelters in logs, under coarse woody debris and in ground litter. It appears to prefer a diversity of gilgai size and depth and with some fringing groundcover vegetation and ground timber and where soils are of a high clay content with deep-cracking characteristics. Habitat patches greater than 10 ha and connected to larger areas of remnant vegetation are preferred (DotE 2015l). The Draft Referral guidelines for the nationally listed Brigalow Belt reptiles describes gilgai depressions and mounds as being important habitat with habitat connectivity between gilgais and other suitable habitats also being important (SEWPaC 2011c). ***Foraging habitat:*** It prefers habitats where there is an abundance of burrowing frog species (DotE 2015l). ***Refuge habitat:*** This species seeks refuge in soil cracks on gilgai mounds within habitat areas. ***Notable features:*** This species is generally inactive during the day sheltering under microhabitat features. It is active and forages at night. ***Nearest record:*** One individual was recorded in the study area during field surveys. The next nearest record of this species is approximately 5 km west of the study area (BirdLife Australia 2015b).	It is expected that the individual recorded during the surveys was dispersing through the landscape between preferred habitat areas outside the study area.
Yakka Skink (*Egernia rugosa*)	V	V	PMST	***Distribution:*** The distribution of this species is highly fragmented. It extends from the coast to the hinterland of sub-humid to semi-arid eastern Queensland. It has been recorded between the Queensland/New South Wales border to Mungkan Kandju National Park on Cape York Peninsula, and from Bundaberg and the region west of	**Low:** There are some areas of rocky habitat within the study area but the site lacks log piles and large hollow logs are generally sparse within the study area. There

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				Gympie to Mariala National Park west of Charleville (DotE 2015m). ***General habitat preferences:*** This species occurs in woodland and open forest habitats, wet/dry sclerophyll forest and ecotonal rainforest habitats. This species is commonly found in cavities under and between partly buried rocks, logs or tree stumps, root cavities and abandoned animal burrows. The species often takes refuge in large hollow logs and has been known to excavate deep burrow systems, sometimes under dense ground vegetation (Cogger 2000 Wilson 2005). In cleared habitat, this species can persist where there are shelter sites such as raked log piles, deep gullies, tunnel erosion/sinkholes and rabbit warrens. The species has also been found sheltering under sheds and loading ramps. This species is not generally found in trees or rocky habitats (Chapple 2003). ***Feeding habitat:*** This species burrows and feeds on soft plant material and fruits as well as a variety of invertebrates that venture into or near the burrow entrance. ***Notable features:*** This species defecates in a pile outside burrow entrances. ***Nearest record:*** This species has not been recorded within 25 km of the study area.	are no records of this species within 25 km of the study area despite numerous fauna surveys being conducted in the Moranbah area. This species was not recorded within the study area during the fauna surveys.
Migratory					
Black-faced Monarch (*Monarcha melanopsis*)	M	SLC	PMST	***Distribution/Habitat preferences:*** Rainforest, eucalypt woodlands and forest (mainly wet sclerophyll), coastal scrubs, rainforest gullies with a dense understorey of ferns and/or shrubs (DotE 2016g, 2015b Pizzey et al. 2012). This is important habitat under the EPBC Act (DotE 2015b). In Queensland this species occurs on the eastern	**Present:** This species was recorded from riparian vegetation fringing Smoky creek.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				slopes of the Great Divide. Also occasionally occurs further inland (DotE 2016g). ***Nearest record:*** This was recorded within the study area.	
Common Greenshank (*Tringa nebularia*)	M	SLC	BirdLife Australia Atlas	***Distribution/Habitat preferences:*** This species occurs mainly in coastal regions with some scattered records south of a line from near Dalby to Mt Guide. It occurs in a variety of inland wetlands and sheltered coastal habitats of varying salinity. This species uses permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats mudflats, saltmarsh, mangroves, seagrass, embayments, harbours, river estuaries, deltas and lagoons. It will also use artificial wetlands and impoundments. It generally does not occur in dry grassland (DotE 2015n). ***Nearest record:*** The nearest record of this species is approximately 12 km south-west of the study area (CSIRO 2016a).	**Low:** The study areas lacks wetlands to provide habitat for this species. This species was not recorded within the study area during the fauna surveys.
Fork-tailed Swift (*Apus pacificus*)	M	SLC	PMST, Birds Australia Atlas	***Distribution/Habitat preferences:*** Aerial species that flies over open habitat sometimes over forests and cities (Pizzey et al. 2012). Sometimes occurs above rainforests, wet sclerophyll forest or pine plantations (DotE 2016h). It occurs in a range of habitat from inland open plains to wooded areas, where it is exclusively aerial (DotE 2015b). ***Nearest record:*** The nearest record of this species is approximately 20 km west of the north-western corner of the study area (BirdLife Australia 2015a).	**Moderate**: This species may overfly the study area as part of a larger foraging range. This species was not recorded within the study area during the fauna surveys.
Latham's Snipe (*Gallinago hardwickii*)	M	SLC	PMST	***Distribution/Habitat preferences:*** Soft wet ground or shallow water with tussocks, wet paddocks, seepage below dams, irrigated areas, scrub or open woodland (Pizzey et al. 2012).	**Low:** The study area does not contain wetland areas to provide habitat for this species. This species has not been recorded in close

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
				Nearest record: This species has not been recorded within 25 km of the study area.	proximity to the study area. This species was not recorded within the study area during the fauna surveys.
Oriental Cuckoo (*Cuculus optatus*)	M	SLC	PMST	***Distribution/Habitat preferences:*** Non-breeding habitat occurs in Australia and is characterised by monsoonal rainforest, vine thickets, wet sclerophyll forest or open *Casuarina*, *Acacia* or *Eucalyptus* woodlands. Frequently in ecotones between habitats. This habitat is considered important under the EPBC Act (DotE 2015b). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** This species is not known from within 25 km of the study area. This species prefers dense forest habitats, which are not present in the study area. This species was not recorded within the study area during the fauna surveys.
Osprey (*Pandion haliaetus*)	M	SLC	PMST	***Distribution/Habitat preferences:*** This species occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands (DotE 2016l). The Osprey has been occasionally observed further inland along major rivers (DotE 2016l). This species requires extensive areas of fresh, brackish or saline waters for foraging (DotE 2016l). Important habitat under the EPBC Act is considered to be bays, estuaries, along tidal stretches of large coastal rivers, mangrove swamps, coral and rock reefs, terrestrial wetlands and coastal lands of tropical and temperate Australia and offshore islands. They are generally found on or near the coast but also range inland along large rivers, mainly in northern Australia. They nest in trees that are usually dead or with dead tops, rocky coastlines and on artificial structures (DotE 2015b). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** The study area does not contain wetland areas or riverine areas to provide habitat for this species. This species has not been recorded in close proximity to the study area. This species was not recorded within the study area during the fauna surveys.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
Rufous Fantail (*Rhipidura rufifrons*)	M	SLC	BirdLife Australia Atlas	***Distribution/Habitat preferences:*** Rainforest, wet eucalypt forests, monsoon forests, paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks (Pizzey et al. 2012). ***Nearest record:*** This species was recorded within the study area.	**Present:** This species was recorded in the study area in Narrow-leaved Red Ironbark and Queensland Blue Gum woodland.
Satin Flycatcher (*Myiagra cyanoleuca*)	M	SLC	PMST	***Distribution/Habitat preferences:*** Heavily vegetated gullies in forests and taller woodlands. During migration, this species prefers coastal forests, woodlands, mangroves, gardens and open country (Pizzey et al. 2012). More common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands this species prefers open, grassy habitats. Habitat becomes more varied during migration and includes most wooded habitats except rainforests, although wintering birds may use rainforests in northern Queensland. All habitats are considered important under the EPBC Act (DotE 2015b). ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** Vegetative structure is unlikely to be suitable for this species in the study area. It prefers a more densely structured closed or riparian forest habitat. This species was not recorded within the study area during the fauna surveys.
Whimbrel (*Numenius phaeopus*)	M	SLC	BirdLife Australia Atlas	***Distribution/Habitat preferences:*** This species has a primarily coastal distribution, with scattered inland records. It is found in all states. Habitats include intertidal mudflats of sheltered coasts, harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats, saltflats with saltmarsh, saline grasslands with standing water and man-made wetland environments. Inland records are from saline lakes and Canegrass swamps (DotE 2015o). ***Nearest record:*** The nearest record of this species is approximately 7 km north-west of the study area (BirdLife Australia 2015a).	**Low:** Although this species has been recorded approximately 7 km to the north-west of the study area, inland occurrences are uncommon and preferred wetland habitat is not present in the study area. This species was not recorded within the study area during the fauna surveys.

Common Name (Species Name)	Status		Record Source[3]	Habitat Preferences	Likelihood to occur in the project area
	EPBC Act[1]	NC Act[2]			
White-throated Needletail (*Hirundapus caudacutus*)	M	SLC	BirdLife Australia Atlas	***Distribution/Habitat preferences:*** Aerial species that occurs over forests, woodlands, farmlands, plains, lakes and towns (Pizzey et al. 2012). It is known from above mainly wooded areas, and larger tracts of vegetation, particularly forest. The species roosts in tree hollows in tall trees on ridge-tops, on bark or rock faces and it is thought to have traditional roost sites (DotE 2015b). Large tracts of forest vegetation and breeding habitat is considered important in Australia (DotE 2015b). ***Nearest record:*** The nearest record of this species is approximately 22 km east of the north-eastern corner of the study area (BirdLife Australia 2015a).	**Moderate**: This species may overfly the study area as part of a larger foraging range. This species was not recorded within the study area during the fauna surveys.
Yellow Wagtail (*Motacilla flava*)	M	SLC	PMST	***Distribution/Habitat preferences:*** This species prefers well-watered open grasslands and the fringes of wetlands. It roosts in mangroves and other dense vegetation. ***Nearest record:*** This species has not been recorded within 25 km of the study area.	**Low:** Wetland habitat is not present in the study area and the species has not been recorded within 25 km of the study area. This species was not recorded within the study area during the fauna surveys.

[1] – EPBC Act Status: E = Endangered, V = Vulnerable, M = Migratory, NL = Not listed
[2] – NC Act Status: E = Endangered, V = Vulnerable, NT = Near threatened, LC = Least concern, SLC = Special least concern
[3] - ALA – Atlas of Living Australia
- PMST – Protected Matters Search Tool (refer to PMST database results contained in Appendix A)
- Wildlife Online (refer to Wildlife Online database results contained in Appendix B)
- Queensland Museum (refer to Queensland Museum database results contained in Appendix D)
- BirdLife Australia Atlas (refer to BirdLife Australia Atlas database results contained in Appendix E)

Appendix K

Regional Ecosystems recorded within the study area

Table K1: Descriptions of field-validated vegetation communities in the study area

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
11.3.2 Poplar Box (*Eucalyptus populnea*) woodland on alluvial plains (Poplar Box alluvial woodland). VM Act Status – Of concern Biodiversity status – Of concern EPBC Act status – *not applicable*	The canopy layer comprised Poplar Box and associated Sally Wattle (*Acacia salicina*) and Carbeen (*Corymbia tessellaris*). The canopy layer had a median height of 15 m and canopy cover intercept ranging from 5 to 10%. The sub-canopy layer comprised mid-mature Poplar Box and was more representative of the EDL. Sally Wattle was also prevalent in this layer. The sub-canopy had a median height of 10 m and cover intercept ranging from 5 to 20% The shrub layer comprised Pegunny (*Lysiphyllum hookeri*), Poplar Box and Sally Wattle. The groundcover layer almost exclusively comprised Buffel Grass (**Pennisetum ciliare*).	Situated on a narrow terrace between the main channel and the broad clay plains to the east. The community is moderately to markedly fragmented, supporting only scattered mature trees with residual mid-mature regrowth or shrubs. A small, shallow overflow basin was recorded on the eastern edge of the community. Historic clearing and subsequent thinning have affected the community, wherein the community only marginally satisfies the criteria for remnant status (i.e. the 70/50 rule).	This community was restricted to a small floodplain terrace on the western side of a tributary to Smoky Creek in the north-west portion of the study area. One assessment site was conducted within this community, i.e. Q32.	 Q32 – looking north and south (below) 

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
Remnant 11.3.4 Queensland Blue Gum (*Eucalyptus tereticornis* subsp. *tereticornis*) and/or *Eucalyptus spp.* on alluvial plains (Queensland Blue Gum alluvial woodland). VM Act Status – Of concern Biodiversity Status – Of concern EPBC Act Status – *not applicable*	This community typically supported a canopy layer dominated by Poplar Box, Queensland Blue Gum, River Red Gum (*Eucalyptus camaldulensis* var. *obtusa*) and Carbeen. The canopy layer had a median height of 18 m and canopy cover intercept ranging from 25 to 30%. The sub-canopy layer comprised Sally Wattle. Less common species included juvenile canopy species, Pegunny and Ironwood (*Acacia excelsa* subsp. *excelsa*). The sub-canopy layer had a median height of 11 m (range 9 to 15 m) and a cover intercept ranging from 10 to 40%. The very sparse shrub layer comprised Pegunny, juvenile canopy species, Leichhardt Bean (*Cassia brewsteri*) and Whitewood (*Atalaya hemiglauca*). The groundcover variously comprised Buffel Grass, Green Panic (**Megathyrsus maximus* var. *pubiglumis*), Indian Blue Grass (**Bothriochloa pertusa*) and Golden Beard Grass (*Chrysopogon fallax*).	This community was moderately intact within its limited distribution but negatively impacted by a large edge to area ratio. The patch is heavily degraded within the groundcover layer and was found to be actively used by cattle due to the proximity of several permanent water points. Some large hollow bearing trees were observed.	This community was limited to a small patch fringing remnant riparian woodland (RE 11.3.25) in the far northern portion of the study area (Figure 10). One assessment site was conducted within this community, i.e. T35.	 T35 – looking north  T35 – looking north

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
Remnant 11.3.25 Queensland Blue Gum or River Red Gum woodland fringing drainage lines (mixed eucalypt riparian woodland). VM Act Status – Least concern Biodiversity Status – Of concern EPBC Act Status – *not applicable*	*Billy's Gully* The canopy layer of the RE 11.3.25 community associated with Billy's Gully comprised Dallachy's Gum (*Corymbia dallachiana*), Carbeen, Narrow-leaved Red Ironbark (*Eucalyptus crebra*), Clarkson's Bloodwood (*Corymbia clarksoniana*), Queensland Blue Gum and Poplar Box. River Red Gum tended to be prevalent in and adjacent to the channel. The height of the canopy ranged from 15 to 20 m (median of 17 m) and had a cover intercept ranging from 10 to 30%. The sub-canopy layer comprised juvenile canopy species and Sally Wattle. The sub-canopy layer had a median height of 11 m (range 9 to 15 m) and a cover intercept ranging from 10 to 40%. The shrub layer was generally sparse and comprised juvenile canopy species and Sally Wattle. Other species included Pegunny, Leichhardt Bean and Ironwood. The groundcover variously comprised Buffel Grass, Green Panic, Indian Blue Grass, Golden Beard Grass, Kangaroo Grass (*Themeda triandra*) and Black Speargrass (*Heteropogon contortus*). *Smoky Creek* The canopy layer of the RE 11.3.25	*Billy's Gully* The RE 11.3.25 community associated with Billy's Gully appeared to be moderately intact with evidence of selective timber removal. The most likely species targeted for removal were Narrow-leaved Red Ironbark, Queensland Blue Gum and River Red Gum with the latter now largely restricted to the channel. The eastern side of the drainage line has been historically cleared up to the high bank with significant scouring evident in places. Mature hollow-bearing trees were infrequent and were generally restricted to the channel and bank areas. The groundcover of the community was moderately to significantly degraded by exotic grasses and herbs. Black Speargrass, Forest Bluegrass (*Bothriochloa bladhii*) along with Spiny-headed Mat Rush	*Billy's Gully* The RE 11.3.25 community associated with Billy's Gully was recorded as a single patch fringing both sides of Billy's Gully in the southern portion of the study area (Figure 10). Assessment sites within this community included S5 and S6 along with a number of tertiary and quaternary assessment sites. *Smoky Creek* The RE 11.3.25 community associated with Smoky Creek fringes Smoky Creek and its unnamed tributary in the northern portion of the study area (Figure 10). Assessment sites within this community included S9, S13, S14 and S24, and S24 along its tributary, and a number of tertiary	 S5 – looking north  T12 – channel, looking north (dry season survey)

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
	community associated with Smoky Creek was dominated by River Red Gum and/or Queensland Blue Gum. Other species included Carbeen and River Oak (*Casuarina cunninghamiana*). Less frequently observed species included Dallachy's Gum, Sally Wattle and the occasional Brigalow (*Acacia harpophylla*) along the community's edge. The canopy height ranged from 15 to 25 m (median 21 m), with the occasional 27 m tree. The canopy cover intercept ranged from 15 to 40%. The sub-canopy layer was dominated by Black Tea Tree (*Melaleuca bracteata*), River Oak in and immediately adjacent to the channel, and juvenile canopy species. Other prevalent species included Yellowwood (*Terminalia oblongata*), taller Pegunny and Small-leaved Fig (*Ficus obliqua*). The sub-canopy layer had a median height of 14 m (range 10 to 16 m) and an average cover intercept of 10 to 30%. The shrub layer variously comprised Pegunny, Black Tea Tree, Sally Wattle, Sandpaper Fig (*Ficus opposita*), Yellowwood and Brigalow. Green Panic commonly dominated the groundcover layer. Other species included Buffel Grass, Indian Blue Grass, *Aristida personata* (no common name), Forest Bluegrass,	(*Lomandra longifolia*) and *Cyperus esculentus* were recorded from lower lying areas closer to the channel. <u>*Smoky Creek*</u> The RE 11.3.25 community associated with Smoky Creek was moderately intact with a relatively continuous distribution along both banks of Smoky Creek. However, the community has been cleared to the top of the high bank in places and the creek is heavily used by cattle. Sections show significant bank scouring, canopy dieback and evidence of over grazing. Mature, hollow-bearing trees were commonly recorded throughout this community. The ground cover on the banks and in the channel was heavily degraded with dense exotic grasses dominating. Parthenium weed (**Parthenium hysterophorus*), a declared Category 3	and quaternary assessment sites. Recent high volume flow events had stripped some of the vegetative cover on much of the bank and low terraces, and in places flattened some shrubs.	 S6– looking east  S9 – looking south

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
	Cyperus spp. and Spiny-headed Mat-rush.	pest under the provisions of the Biosecurity Act, was scattered throughout the groundcover on both sides of the creek.		 S13 – looking east  S14 – looking north

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
Remnant 11.5.3 Poplar Box, +/- Silver-leaved Ironbark (*Eucalyptus melanophloia*), +/- Clarkson's Bloodwood woodland on Cainozoic sand plans and/or remnant surfaces (Poplar Box woodland). VM Act Status – Least concern Biodiversity status – No concern at Present EPBC Act status – *not applicable*	This community typically supported a canopy layer dominated by Poplar Box with the occasional Narrow-leaved Red Ironbark and Clarkson's Bloodwood (primarily infiltrating from adjacent vegetation types). The canopy layer had a broad height range due to the absence of large, mature trees in some patches. Commonly the canopy had a median height of 17 m and canopy cover intercept ranging from 15 to 30%. The sub-canopy, where present, also primarily comprised Poplar Box. Other species included Narrow-leaved Red Ironbark and Ironwood. The sub-canopy layer had a median height of 12 m (range 9 to 14 m) and a cover intercept ranging from less than 5 to 40%. In some instances the sub-canopy was representative of the EDL. The shrub layer variously comprised Ironwood, Early Flowering Black Wattle (*Acacia leiocalyx* subsp. *leiocalyx*), Pegunny, Leichhardt Bean, Poplar Box, Sally Wattle, Quinine Bush (*Petalostigma pubescens*) and/or Cocaine Bush (*Erythroxylum australe* s. str.). The ground layer variously comprised Buffel Grass,	This community was moderately intact across the study area. However, felled trees along with old and new tracks associated with exploration and drilling have created a discontinuous canopy in many areas. Some large hollow-bearing Poplar Box trees were still present particularly in the less disturbed parts of the larger patch of this community. Native groundcover was present in less disturbed areas of the community. However, dense patches of exotic grasses were also prevalent.	This community occurred in four distinct patches. The largest patch was situated across the western central portion of the study area, a second moderate sized patch was situated north-east of the central portion of the study area, while the remaining two smaller patches were situated to the south-east and south of the central portion of study area (Figure 10). Assessment sites within this community included S1, S4 and S17 along with a number of tertiary and quaternary assessment sites.	 S1 – looking north  S4 – looking south (dry season)

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
	Wiregrasses (*Aristida spp.*), Golden Beard Grass, *Waltheria indica* (no common name), Red Natal Grass (**Melinis repens*) and Black Speargrass.			 S17 – looking north
Remnant 11.5.8b Clarkson's Bloodwood, Queensland Peppermint (*Eucalyptus exserta*), Narrow-leaved Red Ironbark, Queensland Blue Gum, Poplar Gum (*Eucalyptus platyphylla*) woodland on Cainozoic sand plains and/or remnant surfaces (Narrow-leaved Red Ironbark-Queensland Blue Gum woodland). VM Act Status –	The canopy of this community primarily comprised Narrow-leaved Red Ironbark and Queensland Blue Gum. Other prevalent species encountered included Clarkson's Bloodwood and Poplar Box. Less frequently encountered species included Poplar Gum and Carbeen. The canopy layer height ranged from 13 to 20 m (median 17 m). The canopy cover intercept ranged from 10 to 15%. The low sub-canopy comprised Black Wattle (*Acacia julifera* subsp. *julifera*), Clarkson's Bloodwood, Silver Oak (*Grevillea parallela*) and Narrow-leaved Red Ironbark. The sub-canopy layer had a median height of 8 m (range 6 to 10 m) and a cover intercept ranging from less than 5 to 20%. The generally very sparse shrub	This community was relatively intact except towards the northern portion of the patch inside the mining lease. The community tended towards a grassy woodland to the east, while the shrub layer tended to thicken towards the ecotone with adjoining communities. Exotic grasses dominated the groundcover. Native grass and herb species occurred in patches but only formed a minor component of the groundcover.	This community was restricted to a small patch along the eastern boundary of the study area, north of Billy's Gully (Figure 10). Two assessment sites were located within this community; including S18 and T9.	 S18 – looking north

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
Least concern Biodiversity status – No concern at present EPBC Act status – *not applicable*	layer variously comprised Quinine Bush, Black Wattle and Yellow-barked Paperbark (*Melaleuca nervosa*). The groundcover composition primarily comprised Buffel Grass. Other species included Red Natal Grass, Wiregrasses, Indian Blue Grass, *Urochloa piligera* (no common name) and *Waltheria indica*.			 S18 – looking east
Remnant 11.5.9 Narrow-leaved Red Ironbark and other *Eucalyptus* and *Corymbia* species woodland on Cainozoic sand plans and/or remnant surfaces (Narrow-leaved Red Ironbark woodland). VM Act Status – Least concern Biodiversity status – No concern at present EPBC Act status –	The canopy of this community comprised Narrow-leaved Red Ironbark with Clarkson's Bloodwood, Dallachy's Gum, Carbeen and/or Poplar Box also present. The canopy layer height ranged from 16 to 21 m (median 17 m). The canopy cover intercept ranged from 15 to 20%. The sub canopy, where present, comprised mid-mature canopy species and the occasional Crows Ash (*Flindersia australis*), Ironwood and Lancewood (*Acacia shirleyi*). Early flowering Black Wattle and Red Ash (*Alphitonia excelsa*) were locally abundant. The sub-canopy layer had a median height of 13 m (range 9 to 15 m) and a cover intercept ranging from 5 to 10%.	The canopy in this community tended to be moderately to highly fragmented. There is evidence of historic timber removal, as stags and fallen logs are prevalent. Some patches were bisected by fence lines and tracks. Buffel Grass and Red Natal Grass were prevalent throughout this community.	This community was recorded in three small patches in the eastern and central portions of the study area (Figure 10). Assessment sites within this community included S19 and S21 along with three tertiary sites.	 S19 – looking east

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
not applicable	The shrub layer was generally sparse and variously comprised Quinine Bush, Black Wattle, Red Ash, Ironwood and juvenile canopy species. Less frequently encountered species included Early Flowering Black Wattle, Prickly Pine (*Bursaria incana*), Vine Tree (*Ventilago viminalis*), Whitewood and Cocaine Bush. The groundcover primarily comprised Buffel Grass, Wiregrasses, *Waltheria indica* and Red Natal Grass. Native species such as Black Speargrass, Kangaroo Grass and Barbwire Grass (*Cymbopogon refractus*) were more prominent in the southern patches.			 S21 – looking north  T10 – looking north (dry season)

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
Remnant 11.5.12 Clarkson's Bloodwood woodland and other *Corymbia* and *Eucalyptus* species on Cainozoic sand plains and/or remnant surfaces (Clarkson's Bloodwood woodland). VM Act Status – Least concern Biodiversity status – No concern at present EPBC Act status – *not applicable*	The canopy layer was dominated by Clarkson's Bloodwood with Carbeen also prevalent. The occasional Poplar Box was also recorded. The height of the canopy ranged from 14 to 21 m (median of 17 m). The canopy had a cover intercept ranging from 15 to 30%. The sub-canopy was dominated by juvenile canopy species as well as Lancewood, Yellow-barked Paperbark and Early Flowering Black Wattle. The sub-canopy had a median height of 10 m (range 7 to 12 m) and a cover intercept of less than 5 to 15%. The sparse to mid-dense shrub layer variously comprised Yellow-barked Paperbark, Quinine Bush, Black Wattle, Red Ash, Prickly Pine, Early Flowering Back Wattle and juvenile canopy species. The groundcover mostly comprised Red Natal Grass and Buffel Grass. Golden Beard Grass, *Aristida spp.*, *Waltheria indica* and Shrubby Stylo (**Stylosanthes scabra*) were also prevalent.	The community was moderately fragmented despite being a naturally sparse vegetation type. There was evidence of pulled timber in the form of stags, logs and stumps throughout much of the community. The shrub layer tended to thicken in places where the canopy was missing. Large trees and stags were present throughout the community with many supporting hollows. The groundcover was highly degraded throughout the community being largely dominated by exotic grasses and herbs.	This community was the dominant vegetation type in the study area and occurred as one large patch running through the centre of the study area (Figure 10). Assessment sites within this community included S2, S7, and S16 along with a number of tertiary and quaternary assessment.	 S2 – looking north  S16 – looking east

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
Remnant 11.7.2 *Acacia* species woodland on Cainozoic lateritic duricrust. Scarp retreat zone (Lancewood woodland). VM Act Status – Least concern Biodiversity status – No concern at present EPBC Act status – *not applicable*	The canopy layer primarily comprised Lancewood with emergent Clarkson's Bloodwood and Carbeen scattered throughout. The height of the canopy ranged from 10 to 17 m (median of 14 m), with the occasional 19 m tree recorded. The canopy had a highly variable cover intercept that ranged from less than 5 to 60%. The sub-canopy, where present, was dominated by Lancewood with Red Ash and Bendee-bendee (*Acacia catenulata*) being less frequently recorded. The sub-canopy had a median height of 9 m (range (6 to 10 m) and a cover intercept of 40 to 60%. The tall shrub layer, where present, variously comprised Lancewood, Red Ash, Bendee-bendee and Bitter Bark (*Alstonia constricta*). Less frequently encountered species include Broad-leaved Wilga (*Geijera salicifolia*), Northern Sandalwood (*Santalum lanceolatum*) and Yellowwood. The low shrub-layer, where present, variously comprised Cocaine Bush, Soft Acalypha (*Acalypha eremorum*) and Bitter Bark. The groundcover variously comprised Hooky Grass (*Ancistrachne uncinulata*), Jericho	The community generally had a discontinuous and fragmented canopy. Even-aged cohorts of regrowth are the likely result of historic clearing and/or high frequency of fires. Historic clearing may also be responsible for the colonisation of areas by *Corymbia spp*. Fencing and tracks also lend to the fragmentation. The community supported moderate species richness particularly in the gully and scarp retreat zone in the northern extent of the community distribution. Vine thicket generalists tended to be prevalent at these locations. The ground cover composition was variable but generally dominated by native species. However, some of the gullies were heavily degraded by Green Panic. The underlying laterite	This community was recorded along the eastern boundary of the study area. The community was recorded in five patches, one large and four small relic patches (Figure 10). The community was associated with a minor lateritic rise. Assessment sites within this community included S15 and S20 as well as a number of tertiary and quaternary assessment.	 S15 – looking east (dry season)  T3 – looking east (dry season)

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
	Wiregrass (*Aristida jerichoensis*) and *Calyptochloa gracillima* (no common name). Green Panic, Sabi Grass (**Urochloa mosambicensis*) and Red Natal Grass were locally prevalent in places.	(scalds) was exposed at the surface in a number of areas and generally lacked vegetative cover.		 S20 – looking north
Remnant 11.8.5 Mountain Coolabah (*Eucalyptus orgadophila*) open woodland on Cainozoic igneous rocks (Mountain Coolabah woodland). VM Act Status – Least concern Biodiversity status – No concern at present EPBC Act status – *not applicable*	The canopy layer comprised Mountain Coolabah with occasional taller Variable-barked Bloodwood (*Corymbia erythrophloia*) also present. The height of the canopy ranged from 12 to 15 m (median of 14 m). The canopy had a cover intercept ranging from 15 to 20%. The sparse tall shrub layer comprised canopy species, Red-flowered Bauhinia (*Lysiphyllum carronii*), Quinine Bush and Prickly Pine. The sparse low shrub layer variously comprised Cocaine Bush, Quinine Bush, Currant Bush (*Carissa ovata*), Northern Sandalwood, Native Gardenia (*Larsenaikia ochreata*) and Yellowberry (*Denhamia cunninghamii*).	The community was moderately fragmented due to canopy dieback. The adjacent plains and low rises have been cleared and recently blade-ploughed. The ground cover was generally dominated by exotic grasses however native species were prevalent in patches.	This community was recorded towards the north eastern portion of the study area and was associated with a residual basalt rise (Figure 10). Improved pasture and some minor woody regrowth vegetation surrounded the community. Three assessment sites were located within this community; including S3, S23 and Q10.	 S3 – looking west

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
	Several small patches of vine thicket generalists were recorded in the south-western portion of the patch. These areas were considered representative of RE 11.8.5a but were too small to map (i.e. less than 1 ha). Common species included Soft Acalypha, Narrow-leaved Croton (*Croton phebalioides*), Small-leaved Ebony (*Diospyros humilis*), Yellowwood and Pegunny. The groundcover comprised Buffel Grass, Red Natal Grass, Indian Blue Grass, Black Speargrass, Wiregrasses and *Scleria mackaviensis* (no common name). Hooky Grass was common in the small patch of vine thicket generalists.			 S23 – looking south  Small patch of vine thicket at south-west end of spur

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
Remnant 11.9.7a Poplar Box, False Sandalwood (*Eremophila mitchellii*) shrubby woodland on fine-grained sedimentary rocks (Poplar Box and Dawson River Gum woodland). VM Act Status – Of concern Biodiversity status – Of concern EPBC Act status – *not applicable*	The canopy layer comprised Poplar Box with the occasional Dawson River Gum (*Eucalyptus cambageana*) also present. The height of the canopy ranged from 10 to 15 m (median of 13 m) and had a cover intercept of 15 to 30%. The sub-canopy layer comprised Poplar Box with Ironwood, Sally Wattle, Western Rosewood (*Alectryon oleifolius* subsp. *elongatus*) and Brigalow less frequently encountered. The sub-canopy layer had a median height of 7 m (range 5 to 9 m) and a cover intercept of 5 to 20%. A sparse shrub layer variously comprised Dead Finish (*Archidendropsis basaltica*), Scrub Boonaree (*Alectryon diversifolius*), Pegunny, Leichhardt Bean and Currant Bush. Buffel Grass dominated the groundcover with **Sida* spp. and Melhania (*Melhania oblongifolia*) also prevalent.	The southern patch and north-eastern distribution of this community was moderately intact but tended towards even-age regrowth in the west. Exotic grasses primarily dominated the ground cover. However a variety of native herbs were also prevalent.	This community was limited to two patches in the north-east of the study area either side of Smoky Creek (Figure 10). Four assessment sites were located within this community; including S10, S22, T24 and Q25.	 S10 – looking east  S22 – looking north

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
Non-remnant Vegetation	The distribution of non-remnant woody regrowth vegetation was limited within the study area. Most areas that were representative of non-remnant vegetation had been historically cleared, routinely mechanically maintained and/or pasture improved, primarily with Buffel Grass and Shrubby Stylo. Woody regrowth was commonly recorded in the vicinity of Smoky Creek and its tributaries. These patches comprised Brigalow regrowth, Poplar Box regrowth or mixed eucalypt scrubby regrowth. The gently undulated plains and low rises beyond these systems were, in places, also found to support scrubby Brigalow regrowth. The EDL of all of these patches fail to satisfy the criteria for remnant status as defined under the VM Act. A large patch of scrubby regrowth was identified in the eastern extent of the study area. This patch is currently mapped as remnant Poplar Box woodland and Lancewood open forest (90/10%). This patch would have historically supported Narrow-leaved Red Ironbark (RE 11.5.9) but instead comprised Quinine Bush, Prickly Pine, Red Ash, Black Wattle and Early-flowering Black Wattle. The shrub layer was representative of	The composition of these communities was quite variable due to the historic composition of the vegetation communities that would have subsisted prior to clearing. In general the groundcover layer within these patches was heavily degraded by exotic grasses, particularly Buffel Grass and/or Red Natal Grass.	These communities were commonly recorded in the vicinity of Smoky Creek and its tributaries as well as adjacent plains and low rises. A large patch of scrubby regrowth was also recorded in the eastern extent of the study area.	 S12 (Brigalow regrowth) – looking east  Q30 (scrubby Brigalow regrowth) – looking north

Regional Ecosystem	Species and Structural Composition	Condition	Location	Representative Photograph
	the EDL and had a median height of 4 m and cover intercept ranging from 25 to 40%.			 T11 (scrubby Quinine Bush and wattle regrowth)

1 EPBC Act status is only relevant if the RE meets the EPBC Act condition thresholds and key diagnostic criteria for the relevant TEC (TEC status current as at July 2016).
2 Queensland REs are not individually listed under the EPBC Act, but may form part of a TEC listed under the EPBC Act.

Appendix L

Flora species recorded during seasonal surveys of the project site

Table L1: Flora field species list for the project site

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Cyperaceae	*Abildgaardia obovata*	*ncn*	LC			+(t)						+		
Malvaceae	*Abutilon malvifolium*	Mallow-flowered Lantern Flower	LC											1
Malvaceae	*Abutilon micropetalum*	Small-flowered Lantern Bush	LC									1	+	
Malvaceae	*Abutilon oxycarpum* var. *subsagittatum*	Lantern Bush	LC								2(t)		+	
Mimosaceae	*Acacia catenulata*	Bendee-bendee	LC								+-2(t)			
Mimosaceae	*Acacia excelsa* subsp. *excelsa*	Ironwood	LC	1	2	1-3	2		1	2(t)	1		3	
Mimosaceae	*Acacia harpophylla*	Brigalow	LC		+(e)	+-4(e,t)						+-2(e,t)		
Mimosaceae	*Acacia julifera* subsp. *julifera*	Black Wattle	LC			+(t)	1	3-4	2	1-4				
Mimosaceae	*Acacia leiocalyx* subsp. *leiocalyx*	Early-flowering Black Wattle	LC							+-3				
Mimosaceae	*Acacia salicina*	Sally Wattle	LC	3-4	3-4	1-4	1-2					+(t)	2	
Mimosaceae	*Acacia shirleyi*	Lancewood	LC						2		4(-6)			
Euphorbiaceae	*Acalypha eremorum*	Soft Acalypha	LC			+-4				3(t)	+-5(t)	+-3(t)		
Asteraceae	*Acanthospermum hispidum*	Star Burr	*			+(t)								
Amaranthaceae	*Achyranthes aspera*	Chaff Flower	LC			+				+-1		+	1	
Asteraceae	*Ageratum conyzoides*	Billygoat Weed	*			+								
Sapindaceae	*Alectryon connatus*	Grey Bird's Eye	LC				+(c,t)			2(t)				
Sapindaceae	*Alectryon diversifolius*	Scrub Boonaree	LC			+-1	+(t)			3(t)		1-(3)	1	
Sapindaceae	*Alectryon*	Western	LC	1		+(t)						+	1	

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
	oleifolius subsp. *elongatus*	Rosewood												
Poaceae	*Alloteropsis cimicina*	Small Cockatoo Grass	LC	1						+	3-4			
Rhamnaceae	*Alphitonia excelsa*	Red Ash	LC			+	1		3-4	1-4	2	+		
Apocynaceae	*Alstonia constricta*	Bitterbark	LC				2			2	2			
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed	LC			+								
Amaranthaceae	*Alternanthera nana*	(a) Joyweed	LC	+			1-2		+	+	1		2	
Amaranthaceae	*Amaranthus viridis*	Green Amaranth	LC									+(t)	1	
Lythraceae	*Ammannia multiflora*	Jerry-jerry	LC											
Loranthaceae	*Amyema congener* subsp. *congener*	Variable Mistletoe	LC											
Loranthaceae	*Amyema quandang* var. *bancroftii*	Grey Mistletoe	LC											
Poaceae	*Ancistrachne uncinulata*	Hooky Grass	LC							1(t)	1-5	+-2(t)	1	
Capparaceae	*Apophyllum anomalum*	Warrior Bush	LC											+
Mimosaceae	*Archidendropsis basaltica*	Dead Finish	LC			+-2	+-4		2-3	2(t)			+-2(t)	
Poaceae	*Aristida calycina* subsp. *calycina*	Dark Wiregrass	LC	1		+(t)	+-1	2	2	2	2	1-2	2	
Poaceae	*Aristida calycina* subsp. *praealta*	Dark Wiregrass	LC								1(t)			
Poaceae	*Aristida caput-medusae*	Many-headed Wiregrass	LC								3			
Poaceae	*Aristida gracilipes*	*ncn*	LC									1-3		
Poaceae	*Aristida holathera*	Erect Kerosene Grass	LC							+				
Poaceae	*Aristida hygrometrica*	Northern Kerosene Grass	LC				1(t)			+-4				
Poaceae	*Aristida*	Jericho	LC			1	1(-4t)	2-4	2	1-4	+-		2	

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
	jerichoensis	Wiregrass									1(c,t)			
Poaceae	*Aristida latifolia*	Kerosene Grass	LC	1		+(t)	2	1-3	3	2-3		+		
Poaceae	*Aristida leptopoda*	White Speargrass	LC	+		+-1						2	+	
Poaceae	*Aristida personata*	*ncn*	LC			+-3								
Poaceae	*Aristida pruinosa*	Gulf Feathertop Grass	LC										1	
Poaceae	*Aristida ramosa*	Purple Wiregrass	LC		+		+(t)							
Poaceae	*Astrebla elymoides*	Hoop Mitchell Grass	LC											+
Poaceae	*Astrebla squarrosa*	Bull Mitchell Grass	LC											
Sapindaceae	*Atalaya hemiglauca*	Whitewood	LC	1	2	+-2	+(t)					1	2	
Euphorbiaceae	*Bertya pedicellata*	*ncn*	NT								1(t)			
Asteraceae	*Bidens bipinnata*	Cobbler's Pegs	*	1							+	+		
Nyctaginaceae	*Boerhavia burbidgeana*	(a) Tarvine	LC							+-1	+	+	+	
Nyctaginaceae	*Boerhavia dominii*	Tarvine	LC			1(e,t)							1-2	
Convolvulaceae	*Bonamia media*	*ncn*	LC			1	+-1	2	1-2(t)	2				
Poaceae	*Bothriochloa bladhii*	Forest Bluegrass	LC			+-4						1		
Poaceae	*Bothriochloa decipiens* var. *decipiens*	Pitted Bluegrass	LC	1		+							+	
Poaceae	*Bothriochloa pertusa*	Indian Bluegrass	*	2	1	1-2	1	1-2		+		+-3	+-3(t)	
Poaceae	*Brachyachne convergens*	Native Couch	LC											+-2(t)
Sterculiaceae	*Brachychiton australis*	Large-leaved Bottle Tree	LC			+				+(t)	+(t)	+		
Sterculiaceae	*Brachychiton rupestris*	Narrow-leaved Bottle Tree	LC				+(t)							
Phyllanthaceae	*Breynia*	Coffee Bush	LC			1-2	1	2	2	2	1(t)			

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
	oblongifolia													
Phyllanthaceae	*Bridelia leichhardtii*	Small-leaved Scrub Ironbark	LC			+				+(t)	+(t)			
Acanthaceae	*Brunoniella australis*	Blue Trumpet	LC	+		+-1						2		
Cyperaceae	*Bulbostylis barbata*	*ncn*	LC							1				
Pittosporaceae	*Bursaria incana*	Prickly Pine	LC						1	1-3		4		
Poaceae	*Calyptochloa gracillima*	*ncn*	LC								2-3			
Capparaceae	*Capparis canescens*	Wild Orange	LC								+(t)			
Capparaceae	*Capparis lasiantha*	Nipan	LC			1	+(t)				+	+		
Capparaceae	*Capparis loranthifolia*	Narrow-leaved Bumble Tree	LC										+	
Capparaceae	*Capparis mitchellii*	Wild Orange	LC										+	
Apocynaceae	*Carissa ovata*	Currant Bush	LC	2		1-3	+-2(t)		2	1		2-4	1-2	
Caesalpiniaceae	*Cassia brewsteri*	Leichardt Bean	LC	1	3	1-3	2		+		+	1	3	
Lauraceae	*Cassytha filiformis*	Dodder Laurel	LC							1(t)				
Casuarinaceae	*Casuarina cunninghamiana* var. *cunninghamiana*	River Oak	LC			1								
Fabaceae	*Chamaecrista absus*	*ncn*	LC			+-2	1	2	1	2	2	2		
Euphorbiaceae	*Chamaesyce dallachiana*	*ncn*	LC			+				+	+-2	1		
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed	LC			+-2					+		1	
Adiantaceae	*Cheilanthes sieberi* subsp. *sieberi*	Mulga Fern	LC						+		1(t)			
Chenopodiaceae	*Chenopodium carinatum*	Green Crumbweed	LC							+	2		+	
Poaceae	*Chloris ventricosa*	Tall Chloris	LC				+(t)							
Asteraceae	*Chrysocephalum*	Golden	LC			1	1	2	1	1				

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
	apiculatum	Yellow Buttons												
Poaceae	*Chrysopogon fallax*	Golden Beard Grass	LC	1		+-3	2-3		2-5	2-3	+-3		1	
Rutaceae	*Citrus glauca*	Desert Lime	LC			+-3(e,t)								
Vitaceae	*Clematocissus opaca*	Forest Grape	LC				+(t)			1(t)	1(t)	+(t)		
Cleomaceae	*Cleome viscosa*	Sticky Cleome	LC						1	+-2		2		
Lamiaceae	*Clerodendron floribundum*	Lolly Bush	LC			2				1				
Lamiaceae	*Clerodendron tomentosum*	Lolly Bush	LC			+						1		
Fabaceae	*Clitoria ternatea*	Butterfly Pea	*			+(t)	+							
Commelinaceae	*Commelina cyanea*	*ncn*	LC			1-2	+				1	2	2	
Convolvulaceae	*Convolvulus* sp.(n-r)	*ncn*	LC				+(t)			+				
Sparrmanniaceae	*Corchorus* sp. (n-r)	*ncn*	LC							1(c,t)				
Sparrmanniaceae	*Corchorus trilocularis*	Native Jute	LC			+								
Myrtaceae	*Corymbia clarksoniana*	Long-fruited Bloodwood	LC			+-4		2	3	5	1			
Myrtaceae	*Corymbia dallachiana*	Dallachy's Gum	LC			+-4		2-3	3-4					
Myrtaceae	*Corymbia erythrophloia*	Variable-barked Bloodwood	LC									2		
Myrtaceae	*Corymbia tessellaris*	Carbeen	LC	2	3	1-3				3-4	1			
Amaryllidaceae	*Crinum flaccidum*	River Lily	LC			1								
Fabaceae	*Crotalaria incana*	Woolly Rattlepod	LC			+			+					
Fabaceae	*Crotalaria medicaginea*	Tre-foil Rattlepod	LC			+	1	2	1	1-2				
Fabaceae	*Crotalaria montana*	*ncn*	LC				1							
Fabaceae	*Crotalaria novae-hollandiae*	New Holland Rattlepod	LC			+				+-2				

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Euphorbiaceae	*Croton insularis*	Silver Croton	LC			+				1(t)	2(t)			
Euphorbiaceae	*Croton phebalioides*	Narrow-leaved Croton	LC									+-3(t)		
Apocynaceae	*Cryptostegia grandiflora*	Rubber Vine	* (C3)			+-1(t)								
Cucurbitaceae	*Cucumis anguria*	West Indian Gherkin	*			+-1(t)								
Cucurbitaceae	*Cucumis melo* subsp. *agrestis*	Native Cucumber	LC			+								
Asteraceae	*Cyanthillium cinereum*	Vernonia	*			+-2						1		
Asteraceae	*Cyclophyllum coprosmoides*	Coastal Canthium	LC						1					
Orchidaceae	*Cymbidium canaliculatum*	Black Orchid	LC			+-1(t)					+(t)	+		
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	LC				+(t)				+(e,c,t)	+-2	1	
Poaceae	*Cynodon dactylon*	Green Couch	LC			+								
Cyperaceae	*Cyperus esculentus*	*ncn*	LC			1-2(c,t)							+	
Cyperaceae	*Cyperus fulvus*	*ncn*	LC			1(t)	+-1(t)							
Cyperaceae	*Cyperus gracilis*	Whisker Grass	LC			1-3(t)				1(t)			+	
Cyperaceae	*Cyperus holoschoenus*	*ncn*	LC				1-2	+						
Cyperaceae	*Cyperus pygmaeus*	*ncn*	LC							1(c,t)				
Cyperaceae	*Cyperus rotundus*	Nutgrass	*			+-3(c,t)								
Cyperaceae	*Cyperus sp.*	*ncn*	LC				+				+			
Poaceae	*Dactyloctenium radulans*	Button Grass	LC			+	+			+-2				
Solanaceae	*Datura stramonium*	Common Thorn Apple	*											1
Celastraceae	*Denhamia cunninghamii*	Yellowberry	LC				1		1	2-3(t)		2		
Celastraceae	*Denhamia oleaster*	Stiff Denhamia	LC				+e(t)						1	
Fabaceae	*Desmodium brachypodum*	*ncn*	LC			+					1(t)		1	

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Fabaceae	*Desmodium filiforme*	*ncn*	LC											1
Fabaceae	*Desmodium macrocarpum*	Large-fruited Tre-foil	LC								+(e,t)			
Fabaceae	*Desmodium varians*	Slender Tick-trefoil	LC			1(t)								+
Hemerocallidaceae	*Dianella caerulea*	Blueberry Flax Lily	LC									+(t)		
Poaceae	*Dichanthium aristatum*	Angleton Grass	*			+-2								
Poaceae	*Dichanthium fecundum*	*ncn*	LC			+-3								
Poaceae	*Dichanthium sericeum* subsp. *sericeum*	Queensland Bluegrass	LC											+(t)
Poaceae	*Digitaria ammophila*	Silky Umbrella Grass	LC				1	2	2	1-2				
Poaceae	*Digitaria brownii*	Cotton Panic Grass	LC							+-1	2		1	
Ebenaceae	*Diospyros humilis*	Small-leaved Ebony	LC			+-2	+(t)			2(t)	1(t)	1-(3)		
Acanthaceae	*Dipteracanthus australasicus* subsp. *corynothecus*	*ncn*	LC											+
Sapindaceae	*Dodonaea stenophylla*	Yellow Hopbush	LC									+		
Poaceae	*Echinochloa colona*	Awnless Barnyard Grass	*			+(t)								
Boraginaceae	*Ehretia membranifolia*	Peach Bush	LC			+-3	+-1(t)	+	+(t)	1	1(t)	1-(2)	2	
Chenopodiaceae	*Einadia polygonoides*	Climbing Saltbush	LC											+
Celastraceae	*Elaeodendron australe* var. *integrifolium*	Narrow-leaved Red Olive Plum	LC			+(c,t)				1(t)				
Asteraceae	*Emilia sonchifolia*	Emilia	*			+								
Chenopodiaceae	*Enchylaena tomentosa*	Ruby Saltbush	LC											1

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Poaceae	*Enneapogon gracilis*	Slender Nine-awn	LC			+(t)	1(t)					2		
Poaceae	*Enneapogon lindleyanus*	Cone-top Nineawn	LC				1(t)		1(t)				1	
Poaceae	*Enneapogon polyphyllus*	Leafy Nine-awn	LC							+		+-1		
Poaceae	*Enneapogon virens*	(a) Nine-awn	LC						+	1(t)		1		
Poaceae	*Enteropogon acicularis*	Twirly Windmill Grass	LC	+										
Poaceae	*Enteropogon ramosus*	Curly Windmill Grass	LC			1	+(t)							
Poaceae	*Eragrostis lacunaria*	Purple Lovegrass	LC								2			
Poaceae	*Eragrostis pubescens*	*ncn*	LC						+					
Poaceae	*Eragrostis sororia*	*ncn*	LC						+					
Poaceae	*Eragrostis speciosa*	*ncn*	LC						+					
Poaceae	*Eremochloa bimaculata*	Poverty Grass	LC				1(t)							
Myoporaceae	*Eremophila mitchellii*	False Sandalwood	LC				+(t)			1(t)		1(e,t)		
Poaceae	*Eriachne mucronata*	Wanderrie Grass	LC						1					
Poaceae	*Eriochloa crebra*	Early Spring Grass	LC											+(t)
Erythroxylaceae	*Erythroxylum australe*	Cocaine Bush	LC			1	+(t)		2-3	3-4	3	2		
Myrtaceae	*Eucalyptus camaldulensis* var. *obtusa*	River Red Gum	LC			1-5								
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Red Ironbark	LC			+-4	2(e)	4-5	4-5		(1)			
Myrtaceae	*Eucalyptus orgadophila*	Mountain Coolabah	LC									5-6		
Myrtaceae	*Eucalyptus platyphylla*	Poplar Gum	LC					2						

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Myrtaceae	*Eucalyptus populnea*	Poplar Box	LC	6		+-3	6	1		1(e,t)			6	
Myrtaceae	*Eucalyptus tereticornis* subsp. *tereticornis*	Queensland Blue Gum	LC			+-5		3-4						
Poaceae	*Eulalia aurea*	Silky Browntop	LC			+-2								
Euphorbiaceae	*Euphorbia tannensis* subsp. *deserti*	Desert Spurge	LC				+		+-1	+		1	+	
Laxmanniaceae	*Eustrephus latifolius*	Wombat Berry	LC			1-2	+(t)			1(t)		+-2		
Rubiaceae	*Everistia vacciniifolia* var. *nervosa*	Small-leaved Canthium	LC											1
Rubiaceae	*Everistia vacciniifolia* var. *vaccinifolia*	Small-leaved Canthium	LC								2(t)			
Convolvulaceae	*Evolvulus alsinoides*	Dwarf Morning Glory	LC						1	1	+-1	1	2	
Santalaceae	*Exocarpos latifolius*	Broad-leaved Cherry	LC							1(t)				
Moraceae	*Ficus obliqua*	Small-leaved Fig	LC			+								
Moraceae	*Ficus opposita*	Sandpaper Fig	LC			+-4								
Cyperaceae	*Fimbristylis bisumbellata*	*ncn*	LC				1			1				
Cyperaceae	*Fimbristylis dichotoma*	*ncn*	LC				2		2	1-2	+			
Cyperaceae	*Fimbristylis sp.*	*ncn*	LC							1				
Rutaceae	*Flindersia australis*	Crow's Ash	LC						1	2(t)	1(t)			
Rutaceae	*Flindersia dissosperma*	Scrub Leopardwood	LC											1
Fabaceae	*Galactia tenuiflora*	*ncn*	LC			+	1	+	1	1	+	2	2	
Rutaceae	*Geijera parvifolia*	Wilga	LC			+						+(t)		
Rutaceae	*Geijera salicifolia*	Broad-leaved Wilga	LC								2(t)			
Fabaceae	*Glycine falcata*	*ncn*	LC											+

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Fabaceae	*Glycine tabacina*	Glycine Pea	LC			+-2	+					1		
Fabaceae	*Glycine tomentella*	Woolly Glycine	LC			+-2		2						
Goodeniaceae	*Goodenia glabra*	*ncn*	LC							2				
Goodeniaceae	*Goodenia gracilis*	*ncn*	LC											1
Proteaceae	*Grevillea parallela*	Silver Oak	LC				+(t)							
Tiliaceae	*Grewia latifolia*	Dysentery Bush	LC			+-3	1-2	2	1-2	2	+(t)	1	1	
Cactaceae	*Harrisia martinii*	Harrisia Cactus	* (C3)			+-1				+(t)		1	1	
Boraginaceae	*Heliotropium* sp. (n-r)	*ncn*	LC						+	+				
Poaceae	*Heteropogon contortus*	Black Speargrass	LC			+	+(t)		+	+		3-4	2	
Poaceae	*Heteropogon triticeus*	Giant Speargrass	LC			+-2		+		+				
Malvaceae	*Hibiscus meraukensis*	Merauke Hibiscus	LC											+
Malvaceae	*Hibiscus sturti* var. *sturti*	Hill's Hibiscus	LC				+(t)		1		2			
Malvaceae	*Hibiscus verdcourtii*	Bladder Ketmia	LC											1
Poaceae	*Holcolemma dispar*	*ncn*	LC			+-3								
Fabaceae	*Hovea longipes*	Scrub Hovea	LC											
Fabaceae	*Hovea tholiformis*	*ncn*	LC			+-3			1	1	+-2(c,t)	2-3(t)		
Violaceae	*Hybanthus enneaspermus*	Purple Spade Flower	LC			+-2	+	1	2	2	2(t)	2	1	
Violaceae	*Hybanthus stellarioides*	Spade Flower	LC						2		2			
Fabaceae	*Indigofera colutea*	*ncn*	LC				1	2	1	+-2			+	
Fabaceae	*Indigofera linifolia*	*ncn*	LC			+-2(t)						+(t)		
Fabaceae	*Indigofera linnaei*	*ncn*	LC	+		+								
Colchicaceae	*Iphigenia indica*	Grass Lily	LC					+	1					
Fabaceae	*Ipomoea plebeia*	Bell Vine	LC			1-2						+	+	
Poaceae	*Iseilema vaginiflorum*	Red Flinders Grass	LC											1
Convolvulaceae	*Jacquemontia paniculata*	*ncn*	LC				+(t)					+(t)		

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Oleaceae	*Jasminum didymum* subsp. *racemosum*	Native Jasmine	LC			+-2			+			1(t)	+	
Oleaceae	*Jasminum lineare*	Desert Jasmine	LC				+(t)				+(t)			
Euphorbiaceae	*Jatropha gossypiifolia*	Bellyache Bush	* (C3)			+-1								
Rubiaceae	*Larsenaikia ochreata*	Native Gardenia	LC							+(-2t)	1	2		
Poaceae	*Leptochloa digitata*	Umbrella Canegrass	LC			+-1								
Laxmanniaceae	*Lomandra confertifolia* subsp. *pallida*	*ncn*	LC			+								
Laxmanniaceae	*Lomandra leucocephala*	Woolly-headed Mat Rush	LC							+				
Laxmanniaceae	*Lomandra longifolia*	Spiny-headed Mat Rush	LC			+-2				+				
Laxmanniaceae	*Lomandra multiflora*	Many-flowered Mat Rush	LC						+					
Laxmanniaceae	*Lomandra* sp. (n-r)	*ncn*	LC			+						+		
Loranthaceae	*Lysiana exocarpi*	Harlequin Mistletoe	LC											1
Caesalpiniaceae	*Lysiphyllum carronii*	Red-flowered Bauhinia	LC			1(e,t)								
Caesalpiniaceae	*Lysiphyllum hookeri*	Pegunny	LC		4-5	2-5	+(e,t)			+(-2t)		3-4	3-4	
Fabaceae	*Macroptilium atropurpureum*	Siratro	*			+-2								
Fabaceae	*Macroptilium lathyroides*	Phasey Bean	*			+-2								
Chenopodiaceae	*Maireana microphylla*	Blue Saltbush	LC											+
Malvaceae	*Malvastrum americanum*	Spiked Malvastrum	*			+-2								
Malvaceae	*Malvastrum coromandelianum*	False Mallow	*			1-2								

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Apocynaceae	*Marsdenia australis*	Native Pear	LC								2(t)	+		
Apocynaceae	*Marsdenia microlepis*	*ncn*	LC								1			
Apocynaceae	*Marsdenia pleiadenia*	Downy Milk Vine	LC							+(t)				
Apocynaceae	*Marsdenia viridiflora*	Native Pear	LC							+(t)	+	+(t)		
Poaceae	*Megathyrsus maximus* var. *pubiglumis*	Green Panic	*		4-5	3-5	1		1		1-5	2(t)	1	
Myrtaceae	*Melaleuca bracteata*	Black Tea Tree	LC			3-6								
Myrtaceae	*Melaleuca nervosa*	Yellow-barked Paperbark	LC					+-2(t)		2(t)				
Malvaceae	*Melhania oblongifolia*	Melhania	LC			+-1(t)	2		1-2	1		+	2-3	
Meliaceae	*Melia azedarach*	White Cedar	LC			+								
Poaceae	*Melinis repens*	Red Natal Grass	*			+-2	1(-4t)	2-3	2-4	2-5	2-4	3-4		
Commelinaceae	*Murdannia graminea*	Slug Herb	LC				1(t)		+					
Rutaceae	*Murraya ovalifolia*	Native Mock Orange	LC							+(t)	1(t)			
Myoporaceae	*Myoporum acuminatum*	Boobialla	LC			+-1			+					
Myoporaceae	*Myoporum debile*	Winter Apple	LC									+(t)		
Fabaceae	*Neptunia gracilis*	Native Sensitive Plant	LC			+(t)								
Fabaceae	*Neptunia monosperma*	*ncn*	LC											+
Oleaceae	*Notelaea microcarpa*	Small-fruited Mock Olive	LC			+-2						+		
Amaranthaceae	*Nyssanthes erecta*	*ncn*	LC											1
Cactaceae	*Opuntia aurantiaca*	Tiger Pear	*(C3)										+	
Cactaceae	*Opuntia stricta*	Common Prickly Pear	*(C3)			+(t)								

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Cactaceae	*Opuntia tomentosa*	Velvety Tree Pear	*(C3)			+-1	+(t)		+	+(t)	1	1		
Meliaceae	*Owenia acidula*	Emu Apple	LC			+	1(t)							
Oxalidaceae	*Oxalis perennans*	*ncn*	LC								+			
Bignoniaceae	*Pandorea pandorana*	Wonga Vine	LC			+						+(t)		
Poaceae	*Panicum buncei*	*ncn*	LC						1	2				
Poaceae	*Panicum effusum*	Hairy Panic	LC			+(t)	+(t)			+				
Apocynaceae	*Parsonsia lanceolata*	Rough Silkpod	LC			+-2	1(t)		+		1(t)	1(t)		
Asteraceae	*Parthenium hysterophorus*	Parthenium Weed	*(C3)			+-3					+(t)	+		
Poaceae	*Paspalidium caespitosum*	Brigalow Grass	LC											+-2
Poaceae	*Paspalidium constrictum*	*ncn*	LC				1(t)				1		+	
Poaceae	*Paspalidium globoideum*	Sago Grass	LC											+-2(t)
Poaceae	*Pennisetum ciliare*	Buffel Grass	*		3-4	1-5	5-6	5	4-5	4-5	+-4(t)	3-5	5	
Poaceae	*Perotis rara*	Comet Grass	LC				1	1		2(t)				
Proteaceae	*Persoonia falcata*	Wild Pear	LC				+							
Picrodendraceae	*Petalostigma pubescens*	Quinine Bush	LC				1	4-5	4-5	4-5	+-2(t)	4		
Phyllanthaceae	*Phyllanthus maderaspatensis*	*ncn*	LC			+-1						2		
Phyllanthaceae	*Phyllanthus* sp. (n-r)	*ncn*	LC			+-2(t)	1	2	+-1	+-2		2		
Phyllanthaceae	*Phyllanthus virgatus*	*ncn*	LC			+-2(t)	+-1(t)			2	1(t)			
Pittosporaceae	*Pittosporum angustifolia*	Weeping Pittosporum	LC											+
Pittosporaceae	*Pittosporum spinescens*	Wallaby Apple	LC									2-3		
Anacardiaceae	*Pleiogynium timorense*	Burdekin Plum	LC			+(t)			2	+(t)		1		
Plumbaginaceae	*Plumbago zeylanica*	*ncn*	LC											
Caryophyllaceae	*Polycarpaea corymbosa*	*ncn*	LC											
Polygalaceae	*Polygala*	*ncn*	LC				1	+	+	1				

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
	linearifolia													
Convolvulaceae	*Polymeria ambigua*	*ncn*	LC			+-2								
Convolvulaceae	*Polymeria longifolia*	Peak Downs Curse	LC			+-2	2	2	1	2				
Portulacaceae	*Portulaca bicolor*	*ncn*	LC						+	+-1				
Portulacaceae	*Portulaca filifolia*	Native Pigweed	LC				1-2	+	2	1	1	1	1	
Portulacaceae	*Portulaca oleracea*	Pigweed	*			+	+				+	1	1	
Campanulaceae	*Pratia concolor*	*ncn*	LC			+-2								
Acanthaceae	*Pseuderanthemum tenellum*	*ncn*	LC								+-2		2	
Rubiaceae	*Psydrax attenuatum*	Narrow-leaved Canthium	LC				+			+				
Rubiaceae	*Psydrax johnsonii*	Brigalow Canthium	LC							+(-2t)				
Rubiaceae	*Psydrax odoratum* forma. *buxifolium*	Stiff Canthium	LC								+			
Rubiaceae	*Psydrax oleifolium*	Myrtle Tree	LC											
Fabaceae	*Rhynchosia minima* var. *australis*	Rhyncho	LC			1-2	+(t)					1	2	
Acanthaceae	*Rostellularia adscendens*	Pink Tongues	LC			+-1(t)	1					1-2		
Chenopodiaceae	*Salsola kali*	Soft Roly Poly	LC								+(t)		+	
Santalaceae	*Santalum lanceolatum*	Northern Sandalwood	LC			+				+(-2t)	+(t)	2		
Apocynaceae	*Sarcostemma viminale* subsp. *brunonianum*	Caustic Vine	LC								+(t)			
Goodeniaceae	*Scaevola spinescens*	Prickly Fan Flower	LC											
Poaceae	*Schizachyrium fragile*	Fire Grass	LC							+				
Cyperaceae	*Scleria mackaviensis*	*ncn*	LC			+						2		
Chenopodiaceae	*Sclerolaena tricuspis*	*ncn*	LC			+								

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Scrophulariaceae	*Scoparia dulcis*	Scoparia	*			+-2(t)	1-3							
Caesalpiniaceae	*Senna artemisioides* subsp. *coriacea*	*ncn*	LC											+
Caesalpiniaceae	*Senna corallinoides*	Brigalow Senna	LC			+(t)								
Fabaceae	*Sesbania cannabina*	Sesbania Pea	LC			+								
Poaceae	*Setaria surgens*	(a) Pigeon Grass	LC				1	2	2	2-3	1(t)			
Malvaceae	*Sida cordifolia*	Flannel Weed	LC			+-2	2							
Malvaceae	*Sida corrugata*	Corrugated Sida	LC											1
Malvaceae	*Sida cunninghamii*	*ncn*	LC											
Malvaceae	*Sida fibulifera*	*ncn*	LC								2			
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	*			+-2								
Malvaceae	*Sida rohlenae*	*ncn*	LC			+-1(t)	+-2	+	2	2	1(t)		2	
Malvaceae	*Sida* sp. (n-r)	*ncn*	LC						+		+(t)			
Malvaceae	*Sida spinosa*	Spiny Sida	*			+								
Malvaceae	*Sida subspicata*	Shrub Sida	LC			1	+							
Solanaceae	*Solanum esuriale*	Quena	LC											1(t)
Solanaceae	*Solanum parvifolium*	*ncn*	LC			1(c,t)								
Rubiaceae	*Spermacoce brachystema*	*ncn*	LC			1			+-2	1		1		
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass	LC											+
Verbenaceae	*Stachytarpheta jamaicensis*	Snakeweed	*			+-1(c,t)								
Fabaceae	*Stylosanthes scabra*	Shrubby Stylo	*			2-6	2	2	1	2	1	2	2	
Fabaceae	*Tephrosia* sp.(n-r)	*ncn*	LC			+-2(c,t)						2		
Combretaceae	*Terminalia oblongata*	Yellowwood	LC			1-3						2(e,t)		
Poaceae	*Themeda avenacea*	Native Oatgrass	LC			1-3								
Poaceae	*Themeda triandra*	Kangaroo Grass	LC			1-2						2		

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Poaceae	*Thyridolepis xerophila*	*ncn*	LC								3			
Menispermaceae	*Tinospora smilacina*	Snake Vine	LC								+(t)	+(t)		
Poaceae	*Tragus australianus*	Burr Grass	LC			+(e,t)								
Aizoaceae	*Trianthema portulacastrum*	Black Pigweed	*			+							2	
Aizoaceae	*Trianthema triquetra*	Red Spinach	LC										1	
Zygophyllaceae	*Tribulopis angustifolia*	*ncn*	LC				1	2	+-2	+-1				
Zygophyllaceae	*Tribulus micrococcus*	*ncn*	LC											1
Jonhsoniaceae	*Tricoryne elatior*	*ncn*	LC						2					
Poaceae	*Tripogon loliiformis*	Five Minute Grass	LC				2		1					
Poaceae	*Urochloa mosambicensis*	Sabi Grass	*			1-2	1(t)				1		+	
Poaceae	*Urochloa panicoides*	*ncn*	*											+
Poaceae	*Urochloa piligera*	*ncn*	LC				2	2	2	2-3	+-2	1		
Poaceae	*Urochloa subquadripara*	*ncn*	*											1
Mimosaceae	*Vachellia farnesiana*	Prickly Acacia	*			+-1								
Rhamnaceae	*Ventilago viminalis*	Vine Tree	LC				+(t)					+(t)	1	
Fabaceae	*Vigna lanceolata*	*ncn*	LC			+-2	+							
Asteraceae	*Vittadinia pustulata*	*ncn*	LC			+-1(t)								
Asteraceae	*Vittadinia sulcata*	*ncn*	LC			+						+		
Campanulaceae	*Wahlenbergia queenslandica*	*ncn*	LC			+								
Campanulaceae	*Wahlenbergia stricta*	*ncn*	LC			+(c,t)								
Tiliaceae	*Waltheria indica*	*ncn*	LC			+-2	2	2	2	2-3	1	+		
Asteraceae	*Wedelia spilanthoides*	*ncn*	LC			1(t)	+(t)							
Asteraceae	*Xanthium pungens*	Noogera burr	*			+								

Family Name	Botanical Name	Common Name[1]	NC Act Status (Biosecurity Act Status)[2]	11.3.2[3]	11.3.4[4]	11.3.25	11.5.3	11.5.8b	11.5.9	11.5.12	11.7.2	11.8.5	11.9.7a	*Extras*
Fabaceae	*Zornia dyctiocarpa*	*ncn*	LC							+(t)				
Fabaceae	*Zornia muriculata*	*ncn*	LC			+(t)			+-2	1				

1. *ncn* denotes no common name
2. NC Act Status indicates the Queensland conservation status of each taxon under the NC Regulation: Least concern (LC), Near Threatened (NT), Naturalized Exotic (*).
   [No species that are listed under the EPBC Act were recorded in the Study Area]
   Biosecurity Act Status indicates the Queensland restricted status of some taxon under the Biosecurity Act: Category 3 (C3)
3. A detailed species was not undertaken in the single locations of these two REs due to the small size and poor condition of the patches

\# Relative abundance species was based on the Braun-Blanquet technique cover-abundance scale (Hurst and Allen 2007, Whittaker 1975, Mueller-Dombois 1974) as follows:

- + = one or two individuals only
- 1 = sparse, <5%;
- 2 = any number, <5%;
- 3 = 5 – 24%;
- 4 = 25 – 49%;
- 5 = 50 – 74%;
- 6 = 75 – 100%.

[**Note:** the relative abundance may be annotated with a "(d)", "(t)" or "(wl)". This indicates that the species was recorded:

- (e) - at edge of community
- (ch) - in channel
- (t) - during a traverse within the same RE
- (w) - in a wetland (note: small depression on high flow terrace on Smoky Creek)

Appendix M

Fauna species recorded during seasonal surveys of the project site

Table M1: Fauna field species list - trap sites and infrared camera sites (excluding bats)

Common Name	Scientific Name	Status		Incidental	Trap Sites								Creek	Dam	Infrared Camera Sites				
		NC Act (Biosecurity Act)[1]	EPBC Act[2]		T1	T2	T3	T4	T5	T6	T7	T8			C1	C2	C3	C4	C5
Amphibians																			
Broad-palmed Rocket Frog	*Litoria latopalmata*	LC	NL																
Cane Toad	*Rhinella marina*	*	-	X**X**															
Green Tree Frog	*Litoria caerulea*	LC	NL									**Fu**							
Green-striped Burrowing Frog	*Cyclorana alboguttata*	LC	NL						**Fu, As**										
Knife-footed Frog	*Cyclorana cultripes*	LC	NL						**Fu, Sp**	**Pf, Fu**	**Pf, Fu**	**Pf**							
Ornate Burrowing Frog	*Platyplectrum ornatum*	LC	NL							**Pf, Fu**	**Pf, Fu**	**Pf, Fu**							
Short-footed Frog	*Cyclorana brevipes*	LC	NL				X												
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	LC	NL							**Pf**									
Birds																			
Apostlebird	*Struthidea cinerea*	LC	NL	**X**			X												
Australasian Darter	*Anhinga novaehollandiae*	LC	NL	**X**															
Australasian Grebe	*Tachybaptus novaehollandiae*	LC	NL																
Australasian Pipit	*Anthus novaeseelandiae*	LC	NL	X**X**															
Australian Bustard	*Tachybaptus novaehollandiae*	LC	NL	**X**															
Australian Hobby	*Falco longipennis*	LC	NL	X															
Australian Magpie	*Cracticus tibicen*	LC	NL	X**X**		X			**X**			**X**				IR			
Australian Wood Duck	*Chenonetta jubata*	LC	NL	**X**															
Black Kite	*Milvus migrans*	LC	NL	X															
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	LC	NL	X							**X**								
Black-faced Monarch	*Monarcha melanopsis*	SLC	Mi										X						

Common Name	Scientific Name	Status		Incidental	Trap Sites								Creek	Dam	Infrared Camera Sites				
		NC Act (Biosecurity Act)[1]	EPBC Act[2]		T1	T2	T3	T4	T5	T6	T7	T8			C1	C2	C3	C4	C5
Black-faced Woodswallow	*Artamus cinereus*	LC	NL	**X**			X												
Black-fronted Dotterel	*Elseyornis melanops*	LC	NL											X					
Blue-faced Honeyeater	*Entomyzon cyanotis*	LC	NL				X			**X**			X						
Blue-winged Kookaburra	*Dacelo leachii*	LC	NL							**X**	**X**								
Brolga	*Grus rubicunda*	LC	NL																
Brown Falcon	*Falco berigora*	LC	NL	X**X**															
Brown Goshawk	Accipiter fasciatus	LC	NL									**X**							
Brown Honeyeater	*Lichmera indistincta*	LC	NL										X						
Brown Quail	*Coturnix ypsilophora*	LC	NL								**X**								
Buff-rumped Thornbill	*Acanthiza reguloides*	LC	NL		X														
Channel-billed Cuckoo	*Scythrops novaehollandiae*	LC	NL	**X**															
Cockatiel	*Nymphicus hollandicus*	LC	NL	**X**															
Common Bronzewing	*Phaps chalcoptera*	LC	NL	**X**							**X**								
Crested Pigeon	*Ocyphaps lophotes*	LC	NL	X**X**		X	X			**X**									
Dollarbird	*Eurystomus orientalis*	LC	NL							**X**			X						
Double-barred Finch	*Taeniopygia bichenovii*	LC	NL	X															
Eastern Barn Owl	*Tyto javanica*	LC	NL	Sp, **Sp**															
Eastern Koel	*Eudynamys orientalis*	LC	NL		X				**X**										
Emu	*Dromaius novaehollandiae*	LC	NL	X**X**															
Fairy Martin	*Petrochelidon ariel*	LC	NL	**X**															
Galah	*Eolophus roseicapillus*	LC	NL	X**X**	X		X		**X**	**X**		**X**							
Golden-headed Cisticola	*Cisticola exilis*	LC	NL	**X**															
Grey Butcherbird	*Cracticus torquatus*	LC	NL							**X**	**X**								

Common Name	Scientific Name	Status		Incidental	Trap Sites								Creek	Dam	Infrared Camera Sites				
		NC Act (Biosecurity Act)[1]	EPBC Act[2]		T1	T2	T3	T4	T5	T6	T7	T8			C1	C2	C3	C4	C5
Grey Fantail	*Rhipidura albiscapa*	LC	NL																
Grey Shrike-thrush	*Colluricincla harmonica*	LC	NL	**X**	X														
Grey Teal	*Anas gracilis*	LC	NL	**X**										X					
Grey-crowned Babbler	*Pomatostomus temporalis*	LC	NL	X**X**				X		**X**	**X**								
Horsfield's Bushlark	*Mirafra javanica*	LC	NL	**X**															
Laughing Kookaburra	*Dacelo novaeguineae*	LC	NL		X		X	Sp		**X**	**X**								
Leaden Flycatcher	*Myiagra rubecula*	LC	NL	X	X														
Little Button-quail	*Turnix velox*	LC	NL	**Sp**															
Little Crow	*Corvus bennetti*	LC	NL					X											
Little Friarbird	*Philemon citreogularis*	LC	NL		X		X				**X**	**X**							
Magpie-lark	*Grallina cyanoleuca*	LC	NL	XX						**X**									
Masked Lapwing	*Vanellus miles*	LC	NL	XX										X					
Mistletoebird	*Dicaeum hirundinaceum*	LC	NL	X					**X**		**X**		X						
Nankeen Kestrel	*Falco cenchroides*	LC	NL	X					**X**										
Noisy Friarbird	*Philemon corniculatus*	LC	NL		X	X	X		**X**	**X**	**X**	**X**							
Noisy Miner	*Manorina melanocephala*	LC	NL	XX		X		X											
Olive-backed Oriole	*Oriolus sagittatus*	LC	NL							**X**			X						
Pacific Black Duck	*Anas superciliosa*	LC	NL	X										X					
Pale-headed Rosella	*Platycercus adscitus*	LC	NL	X		X			**X**	**X**		**X**							
Peaceful Dove	*Geopelia striata*	LC	NL						**X**		**X**		X						
Pheasant Coucal	*Centropus phasianinus*	LC	NL								**X**		X						
Pied Butcherbird	*Cracticus nigrogularis*	LC	NL		X				**X**			**X**							
Pied Currawong	*Strepera graculina*	LC	NL		X														
Plumed Whistling-Duck	*Dendrocygna eytoni*	LC	NL	X															
Plum-headed Finch	*Neochmia modesta*	LC	NL																
Rainbow Bee-eater	*Merops ornatus*	LC	NL	XX	X		X	X		X									
Rainbow Lorikeet	*Trichoglossus haematodus*	LC	NL				X	X		X	X								

Common Name	Scientific Name	Status		Incidental	Trap Sites								Creek	Dam	Infrared Camera Sites				
		NC Act (Biosecurity Act)[1]	EPBC Act[2]		T1	T2	T3	T4	T5	T6	T7	T8			C1	C2	C3	C4	C5
Red-backed Fairy-wren	*Malurus melanocephalus*	LC	NL	**X**									X						
Red-winged Parrot	*Aprosmictus erythropterus*	LC	NL				X	X	X			X							
Rufous Fantail	*Rhipidura rufifrons*	SLC	Mi																
Rufous Songlark	*Cincloramphus mathewsi*	LC	NL	**X**															
Rufous Whistler	*Pachycephala rufiventris*	LC	NL	X	X														
Sacred Kingfisher	*Todiramphus sanctus*	LC	NL	X**X**															
Singing Honeyeater	*Lichenostomus virescens*	LC	NL	X						X									
Southern Boobook	*Ninox novaeseelandiae*	LC	NL					Cp	**Sp, Cp**		**Cp**								
Spotted Bowerbird	*Ptilonorhynchus maculatus*	LC	NL									**X**							
Squatter Pigeon	*Geophaps scripta*	V	V	X**X**		X	X					**X**		X					
Straw-necked Ibis	*Threskiornis spinicollis*	LC	NL	X															
Striated Pardalote	*Pardalotus striatus*	LC	NL	X						**X**		**X**							
Striped Honeyeater	*Plectorhyncha lanceolata*	LC	NL	X**X**															
Sulphur-crested Cockatoo	*Cacatua galerita*	LC	NL	X			X			**X**			X						
Tawny Frogmouth	*Podargus strigoides*	LC	NL							**Sp**		**Sp**							
Torresian Crow	*Corvus orru*	LC	NL	X**X**	Ir	X	Ir		**Ir**	**X**		**X**							
Tree Martin	*Petrochelidon nigricans*	LC	NL	X															
Varied Sittella	*Daphoenositta chrysoptera*	LC	NL																
Wedge-tailed Eagle	*Aquila audax*	LC	NL	X**X**				X											
Weebill	*Smicrornis brevirostris*	LC	NL	**X**							**X**	**X**							
Whistling Kite	*Haliastur sphenurus*	LC	NL	X			X			**X**									
White-faced Heron	*Egretta novaehollandiae*	LC	NL	**X**															
White-throated Gerygone	*Gerygone albogularis*	LC	NL	**X**	X			X											

Common Name	Scientific Name	Status		Incidental	Trap Sites								Creek	Dam	Infrared Camera Sites				
		NC Act (Biosecurity Act)[1]	EPBC Act[2]		T1	T2	T3	T4	T5	T6	T7	T8			C1	C2	C3	C4	C5
White-throated Honeyeater	*Melithreptus albogularis*	LC	NL				X												
White-winged Chough	*Corcorax melanorhamphos*	LC	NL	**X**	X		X						X						
Willie Wagtail	*Rhipidura leucophrys*	LC	NL	X			X												
Yellow-throated Miner	*Manorina flavigula*	LC	NL	X						**X**		**X**							
Zebra Finch	*Taeniopygia guttata*	LC	NL	X															
Mammals																			
Feral Cat	*Felis catus*	* (C3, 4, 6)	-	**Sp**			Ir									IR			
Common Brushtail Possum	*Trichosurus vulpecula*	LC	NL		Sp, Ir	Sp	Ir, Sc	Sp	**Ir**	**Sp**		**Ir**	X		IR	IR			IR
Dingo, Domestic Dog	*Canis lupus*	* (C3, 4, 6)	-					TT											
Eastern Grey Kangaroo	*Macropus giganteus*	LC	NL	X**X**				Sp							IR	IR		IR	
Greater Glider	*Petauroides volans*	LC	V				Sp	Sp											
House Mouse	*Mus musculus*	*	-		Pf														
European Rabbit	*Oryctolagus cuniculus*	* (C3, 4, 5, 6)	-	X**X**		X, Sp	Sp, Ir					**Sp, Sc**							
Rufous Bettong	*Aepyprymnus rufescens*	LC	NL	Sp, **Sp**			Ir, Sp									IR			
Short-beaked Echidna	*Tachyglossus aculeatus*	SLC	NL																
Sugar Glider	*Petaurus breviceps*	LC	NL					TT											
Swamp Wallaby	*Wallabia bicolor*	LC	NL	X															
Reptiles																			
Black-headed Monitor	*Varanus tristis*	LC	NL					Fu											

Common Name	Scientific Name	Status		Incidental	Trap Sites								Creek	Dam	Infrared Camera Sites				
		NC Act (Biosecurity Act)[1]	EPBC Act[2]		T1	T2	T3	T4	T5	T6	T7	T8			C1	C2	C3	C4	C5
Box-patterned Gecko	*Lucasium steindachneri*	LC	NL			Sp						**Pf**							
Brown Tree Snake	*Boiga irregularis*	LC	NL				Sp												
Burton's Legless Lizard	*Lialis burtonis*	LC	NL			Fu						**As**							
Bynoe's Gecko	*Heteronotia binoei*	LC	NL		Fu, Sp	Fu, As, Sp	Pf, Fu, As, Sp	Pf, As, Sp	**As**	**As**	**Fu, Sp**	**As, Sp**							
Carpentaria Snake	*Cryptophis boschmai*	LC	NL									**Fu**							
Chain-backed Dtella	*Gehyra catenata*	LC	NL			Sp	Sp				**Sp**								
Common Tree Snake	*Dendrelaphis punctulatus*	LC	NL				TT												
Curl Snake	*Suta suta*	LC	NL				Sp												
Eastern Bearded Dragon	*Pogona barbata*	LC	NL	**X**															
Eastern Brown Snake	*Pseudonaja textilis*	LC	NL	**X**															
Eastern Fat-tailed Gecko	*Diplodactylus platyurus*	LC	NL			Fu													
Eastern Mulch-slider	*Lerista fragilis*	LC	NL						**As**		**As**								
Eastern Robust Slider	*Lerista punctatovittata*	LC	NL				Pf												
Eastern Striped Skink	*Ctenotus robustus*	LC	NL			Fu	Fu		**Fu**	**As**		**Fu**							
Fine-spotted Mulch-skink	*Glaphyromorphus punctulatus*	LC	NL						**Fu**										
Fire-tailed Skink	*Morethia taeniopleura*	LC	NL			Pf	Pf, As		**As**		**As**								
Iridescent Litter-skink	*Lygisaurus foliorum*	LC	NL					Fu			**As**								
Ocellated Velvet Gecko	*Oedura monilis*	LC	NL										X						

Common Name	Scientific Name	Status		Incidental	Trap Sites								Creek	Dam	Infrared Camera Sites				
		NC Act (Biosecurity Act)[1]	EPBC Act[2]		T1	T2	T3	T4	T5	T6	T7	T8			C1	C2	C3	C4	C5
Open-litter Rainbow-skink	*Carlia pectoralis*	LC	NL		As	Pf, As	Pf, As	Pf, As	**As**	**Pf, Fu, As**	**As**	**Pf, Fu, As**							
Ornamental Snake	*Denisonia maculata*	V	V	**X**															
Pale-headed Snake	*Hoplocephalus bitorquatus*	LC	NL										Sp						
Prickly Knob-tailed Gecko	*Nephrurus asper*	LC	NL				Fu		**Fu**		**El**								
Ragged Snake-eyed Skink	*Cryptoblepharus pannosus*	LC	NL			Pf	Pf	As		**As**	**As**	**As**							
Red-naped Snake	*Furina diadema*	LC	NL						**Fu**										
Robust Rainbow-skink	*Carlia schmeltzii*	LC	NL						**As**										
South-eastern Morethia Skink	*Morethia boulengeri*	LC	NL			Pf, Fu, As	Pf, As			**As**	**Pf, As**	**As**							
Yellow-faced Whipsnake	*Demansia psammophis*	LC	NL			Pf, Fu, As	Pf, As					**Fu**							

[1] EPBC Act Status – E = Endangered, V = Vulnerable, Mi = Migratory, NL = Not listed
[2] NC Act Status – E = Endangered, V = Vulnerable, NT = Near threatened, LC = Least concern, SLC = Species least concern, NL = Not listed
Biosecurity Act Status - C = Categories 3, 4, 5 and/or 6
* = Exotic species
Class 2 = declared class 2 pest under the Queensland LP Act
As = Active Search; **Bs** = Bird Survey; **Cp** = Call Playback; **El** = Elliot Trap; **Fu** = Funnel; **H** = Heard; **Ir** = Infrared Camera; **Pf** = Pitfall; **Sc** = Scats; **Sp** = Spotlight; **Tt** = Track or Trace; **X** = Present
Bold text indicates record was obtained during post-wet season survey, standard text indicates record was obtained during dry season survey

Table M2: Fauna field species list - supplementary sites (excluding bats)

Common Name	Scientific Name	Status		Supplementary Sites																								
		NC Act (Biosecurity Act)[1]	EPBC Act[2]	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Amphibians																												
Broad-palmed Rocket Frog	*Litoria latopalmata*	LC	NL																				**H**					
Cane Toad	*Rhinella marina*	*	-					Tt											**H**				**Sp**					
Green Tree Frog	Litoria caerulea	LC	NL																									
Green-striped Burrowing Frog	*Cyclorana alboguttata*	LC	NL																					**Sp**				
Knife-footed Frog	*Cyclorana cultripes*	LC	NL																					**Sp**				
Ornate Burrowing Frog	*Platyplectrum ornatum*	LC	NL																**Sp**									
Short-footed Frog	*Cyclorana brevipes*	LC	NL																									
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	LC	NL																									
Birds																												
Apostlebird	*Struthidea cinerea*	LC	NL																			**X**						
Australasian Darter	*Anhinga novaehollandiae*	LC	NL																									
Australasian Grebe	*Tachybaptus novaehollandiae*	LC	NL														**X**											
Australasian Pipit	*Anthus novaeseelandiae*	LC	NL																									
Australian Bustard	*Tachybaptus novaehollandiae*	LC	NL																									
Australian Hobby	*Falco longipennis*	LC	NL																									
Australian Magpie	*Cracticus tibicen*	LC	NL					X			X							**X**				**X**			**X**	**X**		**X**
Australian Wood Duck	*Chenonetta jubata*	LC	NL																									
Black Kite	*Milvus migrans*	LC	NL																									

Common Name	Scientific Name	Status		Supplementary Sites																								
		NC Act (Biosecurity Act)[1]	EPBC Act[2]	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	LC	NL	X										X			**X**	**X**								**X**	**X**	
Black-faced Monarch	*Monarcha melanopsis*	SLC	Mi																									
Black-faced Woodswallow	*Artamus cinereus*	LC	NL																									
Black-fronted Dotterel	*Elseyornis melanops*	LC	NL																									
Blue-faced Honeyeater	*Entomyzon cyanotis*	LC	NL																						**X**			
Blue-winged Kookaburra	*Dacelo leachii*	LC	NL																									
Brolga	*Grus rubicunda*	LC	NL														**X**											
Brown Falcon	*Falco berigora*	LC	NL																									
Brown Goshawk	*Accipiter fasciatus*	LC	NL																									
Brown Honeyeater	*Lichmera indistincta*	LC	NL																									
Brown Quail	*Coturnix ypsilophora*	LC	NL																									
Buff-rumped Thornbill	*Acanthiza reguloides*	LC	NL										X															
Channel-billed Cuckoo	*Scythrops novaehollandiae*	LC	NL																									
Cockatiel	*Nymphicus hollandicus*	LC	NL																									
Common Bronzewing	*Phaps chalcoptera*	LC	NL																						**X**			**X**
Crested Pigeon	*Ocyphaps lophotes*	LC	NL															**X**										
Dollarbird	*Eurystomus orientalis*	LC	NL																		**X**	**X**				**X**	**X**	
Double-barred Finch	*Taeniopygia bichenovii*	LC	NL														**X**											

Common Name	Scientific Name	Status		Supplementary Sites																								
		NC Act (Biosecurity Act)[1]	EPBC Act[2]	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Eastern Barn Owl	*Tyto javanica*	LC	NL																									
Eastern Koel	*Eudynamys orientalis*	LC	NL																									
Emu	*Dromaius novaehollandiae*	LC	NL																									
Fairy Martin	*Petrochelidon ariel*	LC	NL																									
Galah	*Eolophus roseicapillus*	LC	NL	X							X	X						**X**				**X**				**X**		
Golden-headed Cisticola	*Cisticola exilis*	LC	NL																									
Grey Butcherbird	*Cracticus torquatus*	LC	NL	X									X					**X**				**X**						
Grey Fantail	*Rhipidura albiscapa*	LC	NL										X															
Grey Shrike-thrush	*Colluricincla harmonica*	LC	NL																		**X**							
Grey Teal	*Anas gracilis*	LC	NL																									
Grey-crowned Babbler	*Pomatostomus temporalis*	LC	NL															**X**										
Horsfield's Bushlark	*Mirafra javanica*	LC	NL															**X**										
Laughing Kookaburra	*Dacelo novaeguineae*	LC	NL					X					X									**X**					**X**	
Leaden Flycatcher	*Myiagra rubecula*	LC	NL																									
Little Button-quail	*Turnix velox*	LC	NL																									
Little Crow	*Corvus bennetti*	LC	NL																									
Little Friarbird	*Philemon citreogularis*	LC	NL	X							X							**X**							**X**			
Magpie-lark	*Grallina cyanoleuca*	LC	NL																			**X**						
Masked	*Vanellus miles*	LC	NL														**X**											

Common Name	Scientific Name	Status		Supplementary Sites																								
		NC Act (Biosecurity Act)[1]	EPBC Act[2]	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Lapwing																												
Mistletoebird	*Dicaeum hirundinaceum*	LC	NL															**X**			**X**	**X**						
Nankeen Kestrel	*Falco cenchroides*	LC	NL																									
Noisy Friarbird	*Philemon corniculatus*	LC	NL										X	X				**X**			**X**	**X**			**X**	**X**	**X**	**X**
Noisy Miner	*Manorina melanocephala*	LC	NL	X										X				**X**										
Olive-backed Oriole	*Oriolus sagittatus*	LC	NL																									
Pacific Black Duck	*Anas superciliosa*	LC	NL														**X**											
Pale-headed Rosella	*Platycercus adscitus*	LC	NL								X							**X**				**X**					**X**	**X**
Peaceful Dove	*Geopelia striata*	LC	NL																		**X**				**X**		**X**	
Pheasant Coucal	*Centropus phasianinus*	LC	NL																									
Pied Butcherbird	*Cracticus nigrogularis*	LC	NL															**X**								**X**	**X**	**X**
Pied Currawong	*Strepera graculina*	LC	NL					X				X																
Plumed Whistling-Duck	*Dendrocygna eytoni*	LC	NL																									
Plum-headed Finch	*Neochmia modesta*	LC	NL														**X**											
Rainbow Bee-eater	*Merops ornatus*	LC	NL										X				**X**				**X**					**X**	**X**	
Rainbow Lorikeet	*Trichoglossus haematodus*	LC	NL																			**X**						
Red-backed Fairy-wren	*Malurus melanocephalus*	LC	NL																									
Red-winged Parrot	*Aprosmictus erythropterus*	LC	NL								X							**X**				**X**			**X**			

Common Name	Scientific Name	Status		Supplementary Sites																								
		NC Act (Biosecurity Act)[1]	EPBC Act[2]	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Rufous Fantail	*Rhipidura rufifrons*	SLC	Mi																		**X**							
Rufous Songlark	*Cincloramphus mathewsi*	LC	NL																						**X**			
Rufous Whistler	*Pachycephala rufiventris*	LC	NL									X																
Sacred Kingfisher	*Todiramphus sanctus*	LC	NL															**X**			**X**					**X**		
Singing Honeyeater	*Lichenostomus virescens*	LC	NL														**X**											
Southern Boobook	*Ninox novaeseelandiae*	LC	NL																	**H**								
Spotted Bowerbird	*Ptilonorhynchus maculatus*	LC	NL																									
Squatter Pigeon	*Geophaps scripta scripta*	V	V																									
Straw-necked Ibis	*Threskiornis spinicollis*	LC	NL																									
Striated Pardalote	*Pardalotus striatus*	LC	NL															**X**			**X**	**X**			**X**	**X**	**X**	**X**
Striped Honeyeater	*Plectorhyncha lanceolata*	LC	NL								X																	
Sulphur-crested Cockatoo	*Cacatua galerita*	LC	NL												Sp							**X**				**X**		
Tawny Frogmouth	*Podargus strigoides*	LC	NL	X			Sp																					
Torresian Crow	*Corvus orru*	LC	NL	X				X	X		X	X		X			**X**					**X**			**X**	**X**		
Tree Martin	*Petrochelidon nigricans*	LC	NL																									
Varied Sittella	*Daphoenositta chrysoptera*	LC	NL										X															
Wedge-tailed Eagle	*Aquila audax*	LC	NL																									
Weebill	*Smicrornis*	LC	NL															**X**							**X**	**X**	**X**	**X**

Common Name	Scientific Name	Status		Supplementary Sites																								
		NC Act (Biosecurity Act)[1]	EPBC Act[2]	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
	brevirostris																											
Whistling Kite	*Haliastur sphenurus*	LC	NL																									
White-faced Heron	*Egretta novaehollandiae*	LC	NL																									
White-throated Gerygone	*Gerygone albogularis*	LC	NL								X	X	X													**X**		
White-throated Honeyeater	*Melithreptus albogularis*	LC	NL										X								**X**							
White-winged Chough	*Corcorax melanorhamphos*	LC	NL																									
Willie Wagtail	*Rhipidura leucophrys*	LC	NL																									
Yellow-throated Miner	*Manorina flavigula*	LC	NL																		**X**	**X**			**X**	**X**		**X**
Zebra Finch	*Taeniopygia guttata*	LC	NL														**X**											
Mammals																												
Feral Cat	*Felis catus*	* (C3, 4, 6)	-																									
Common Brushtail Possum	*Trichosurus vulpecula*	LC	NL	Sc	Sp	Sp	Sp	Sc	Sc	Sp									**Sp**	**Sp**	**Sp**		**Sp**	**Sp**				
Dingo, Domestic Dog	*Canis lupus*	* (C3, 4, 6)	-																			**Tt**						
Eastern Grey Kangaroo	*Macropus giganteus*	LC	NL				Sp									Sp		**As**			**As**	**As**				**As**		**As**
Greater Glider	*Petauroides volans*	LC	V																**Sp**				**Sp**	**Sp**				
House Mouse	*Mus musculus*	*	-																									
European Rabbit	*Oryctolagus cuniculus*	* (C3, 4, 5, 6)	-	As		Sp			As Sp																			**As**

Common Name	Scientific Name	Status		Supplementary Sites																								
		NC Act (Biosecurity Act)[1]	EPBC Act[2]	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Rufous Bettong	*Aepyprymnus rufescens*	LC	NL																									
Short-beaked Echidna	*Tachyglossus aculeatus*	SLC	NL	Sc						Sp	Sc																	
Sugar Glider	*Petaurus breviceps*	LC	NL																									
Swamp Wallaby	*Wallabia bicolor*	LC	NL																									
Reptiles																												
Black-headed Monitor	*Varanus tristis*	LC	NL																									**As**
Box-patterned Gecko	*Lucasium steindachneri*	LC	NL																		**Sp**							
Brown Tree Snake	*Boiga irregularis*	LC	NL																									
Burton's Legless Lizard	*Lialis burtonis*	LC	NL				Sp																					
Bynoe's Gecko	*Heteronotia binoei*	LC	NL			Sp	Sp	As	As	As	As	As	As	As		Sp		**As**		**Sp**	**As**	**As**	**Sp**	**Sp**			**As**	**As**
Carpentaria Snake	*Cryptophis boschmai*	LC	NL				As														**Sp**							
Chain-backed Dtella	*Gehyra catenata*	LC	NL		Sp			As	Sp										**Sp**							**As**		
Common Tree Snake	*Dendrelaphis punctulatus*	LC	NL																									
Curl Snake	*Suta suta*	LC	NL																									
Eastern Bearded Dragon	*Pogona barbata*	LC	NL																									
Eastern Brown Snake	*Pseudonaja textilis*	LC	NL																									
Eastern Fat-tailed Gecko	*Diplodactylus platyurus*	LC	NL																									
Eastern Mulch-slider	*Lerista fragilis*	LC	NL																								**As**	

Common Name	Scientific Name	Status		Supplementary Sites																								
		NC Act (Biosecurity Act)[1]	EPBC Act[2]	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Eastern Robust Slider	*Lerista punctatovittata*	LC	NL																									
Eastern Striped Skink	*Ctenotus robustus*	LC	NL					As			As		As								**As**							
Fine-spotted Mulch-skink	*Glaphyromorphus punctulatus*	LC	NL																									
Fire-tailed Skink	*Morethia taeniopleura*	LC	NL																									
Iridescent Litter-skink	*Lygisaurus foliorum*	LC	NL																									
Ocellated Velvet Gecko	*Oedura monilis*	LC	NL									As																
Open-litter Rainbow-skink	*Carlia pectoralis*	LC	NL	As				As	As		As	As	As	As				**As**			**As**	**As**			**As**	**As**		
Ornamental Snake	*Denisonia maculata*	V	V																									
Pale-headed Snake	*Hoplocephalus bitorquatus*	LC	NL																									
Prickly Knob-tailed Gecko	*Nephrurus asper*	LC	NL																									
Ragged Snake-eyed Skink	*Cryptoblepharus pannosus*	LC	NL	As				As				As	As												**As**			
Red-naped Snake	*Furina diadema*	LC	NL																									
Robust Rainbow-skink	*Carlia schmeltzii*	LC	NL																									
South-eastern Morethia Skink	*Morethia boulengeri*	LC	NL	As				As					As	As							**As**	**As**			**As**	**As**		
Yellow-faced Whipsnake	*Demansia psammophis*	LC	NL	As				As					As	As														

[1] EPBC Act Status – E = Endangered, V = Vulnerable, Mi = Migratory, NL = Not listed
[2] NC Act Status – E = Endangered, V = Vulnerable, NT = Near threatened, LC = Least concern, SLC = Species least concern, NL = Not listed
Biosecurity Act Status - C = Categories 3, 4, 5 and/or 6
* = Exotic species
Class 2 = declared class 2 pest under the Queensland LP Act

As = Active Search; **Bs** = Bird Survey; **Cp** = Call Playback; **El** = Elliot Trap; **Fu** = Funnel; **H** = Heard; **Ir** = Infrared Camera; **Pf** = Pitfall; **Sc** = Scats; **Sp** = Spotlight; **Tt** = Track or Trace; **X** = Present
Bold text indicates record was obtained during post-wet season survey, standard text indicates record was obtained during dry season survey

Table M3: Micro-bat field species list (trap sites)

Common Name	Scientific Name	Status		Trap Site	Supplementary Sites			Harp Trap Sites						
		NC Act[1]	EPBC Act[2]	T2	S16	S17	S20	H1	H2	H3	H4	H5	H6	H7
Northern Freetail Bat	*Chaerephon jobensis*	LC	NL											
Gould's Wattled Bat	*Chalinolobus gouldii*	LC	NL								**4**			**1**
Chocolate Wattled Bat	*Chalinolobus morio*	LC	NL								**1**			
Hoary Wattled Bat	*Chalinolobus nigrogriseus*	LC	NL								**1**			
Little Pied Bat	*Chalinolobus picatus*	LC	NL						2		**1**		**2**	**1**
Eastern Bent-winged Bat	*Miniopterus orianae oceanensis*	LC	NL											
Northern Free-tailed Bat	*Mormopterus lumsdenae*	LC	NL											
Eastern Free-tailed Bat	*Mormopterus ridei*	LC	NL											
Long-eared Bat	*Nyctophilus sp.*	LC	NL											
Yellow-bellied Sheath-tailed Bat	*Saccolaimus flaviventris*	LC	NL	H	**Sp**	**H**	**H**							
Inland Broad-nosed Bat	*Scotorepens balstoni*	LC	NL											
Little Broad-nosed Bat	*Scotorepens greyii*	LC	NL											
Broad-nosed Bat	*Scotorepens greyii/sanborni*	LC	NL								**8**		**6**	
Troughton's Sheath-tailed Bat	*Taphozous troughtoni*	LC	NL											
Inland Forest Bat	*Vespadelus braverstocki*	LC	NL											
Eastern Cave Bat	*Vespadelus troughtoni*	LC	NL					1				**1**	**3**	

[1] EPBC Act Status – E = Endangered, V = Vulnerable, NL = Not listed
[2] NC Act Status – E = Endangered, V = Vulnerable, NT = Near threatened, LC = Least concern, NL = Not listed
H = Heard; **Sp** = Spotlight; **1-6** = Number recorded

Bold text indicates record was obtained during post-wet season survey, standard text indicates record was obtained during dry season survey

Table M4: Micro-bat field species list (Anabat sites)

Common Name	Scientific Name	Status		Anabat Sites														
		NC Act[1]	EPBC Act[2]	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Northern Freetail Bat	*Chaerephon jobensis*	LC	NL	A	-	A	-	A	A	A	A	**A**	**A**	**-**	**A**	**-**	**A**	**B**	**A**
Gould's Wattled Bat	*Chalinolobus gouldii*	LC	NL	A	A	A	A	A	A	A	A	**A**	**A**	**B**	**A**	**-**	**A**	**B**	**A**
Chocolate Wattled Bat	*Chalinolobus morio*	LC	NL	A	A	A	A	-	A	A	-								
Hoary Wattled Bat	*Chalinolobus nigrogriseus*	LC	NL	A	B	B	-	A	A	-	A	**-**	**-**	**-**	**B**	**-**	**-**	**-**	**B**
Little Pied Bat	*Chalinolobus picatus*	LC	NL	-	A	B	-	A	A	A	-	**-**	**B**	**B**	**-**	**B**	**-**	**B**	**-**
Eastern Bent-winged Bat	*Miniopterus orianae oceanensis*	LC	NL	-	-	-	-	-	-	-	-	**-**	**B**	**B**	**-**	**B**	**B**	**B**	**B**
Northern Free-tailed Bat	*Mormopterus lumsdenae*	LC	NL	A	A	-	-	-	A	-	-	**A**	**A**	**A**	**-**	**-**	**A**	**A**	**A**
Eastern Free-tailed Bat	*Mormopterus ridei*	LC	NL	B	-	-	-	B	-	B	B	**B**	**-**	**B**	**B**	**-**	**B**	**B**	**B**
Long-eared Bat	*Nyctophilus sp.*	LC	NL	-	-	-	-	-	-	A	A	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**A**
Yellow-bellied Sheath-tailed Bat	*Saccolaimus flaviventris*	LC	NL	A	-	A	A	-	A	A	A	**B**	**-**	**B**	**B**	**-**	**B**	**B**	**B**
Inland Broad-nosed Bat	*Scotorepens balstoni*	LC	NL	-	B	-	-	A	-	B	A	**-**	**-**	**A**	**B**	**-**	**A**	**-**	**-**
Little Broad-nosed Bat	*Scotorepens greyii*	LC	NL	A	A	-	A	A	A	A	A	**A**	**A**	**-**	**A**	**-**	**A**	**B**	**A**
Broad-nosed Bat	*Scotorepens greyii/sanborni*	LC	NL	-	-	-	-	-	-	-	-	**A**	**A**	**B**	**B**	**B**	**A**	**B**	**A**
Troughton's Sheath-tailed Bat	*Taphozous troughtoni*	LC	NL	-	-	-	-	-	-	-	-	**B**	**-**	**-**	**-**	**-**	**-**	**B**	**-**
Inland Forest Bat	*Vespadelus braverstocki*	LC	NL	A	-	A	-	A	A	A	-	**-**	**A**	**A**	**-**	**B**	**A**	**B**	**A**
Eastern Cave Bat	*Vespadelus troughtoni*	LC	NL	A	-	A	-	-	A	A	-	**A**	**-**	**-**	**B**	**-**	**-**	**-**	**A**

[1] EPBC Act Status – E = Endangered, V = Vulnerable, NL = Not listed
[2] NC Act Status – E = Endangered, V = Vulnerable, NT = Near threatened, LC = Least concern, NL = Not listed
A = at least one call from the site was attributed unequivocally to the species; **B =** calls similar to those of the species were recorded, but could not be reliably identified; **-** = species not recorded

Bold text indicates record was obtained during post-wet season survey, standard text indicates record was obtained during dry season survey

Appendix N

EPBC Act critical habitat assessment for the Koala

Table N1: EPBC Act critical habitat assessment for the Koala

Attributes and Scores from Koala Habitat Assessment Tool			Results of Desktop Analysis	
Attribute	**Score**	**Inland**	**Proposed Score**	**Comment**
Koala occurrence	+2 (high)	Evidence of one or more Koalas within the last 5 years.	**0:** No confirmed evidence of Koala within 2 km of the impact area within the last 10 years.	The Wildlife Online database indicates that the nearest known record of this species is between 7 and 10 km from the study area (EHP 2015b). The database provides no further information in relation to the location of this record. No evidence of this species was recorded in the study area during the fauna field surveys.
	+1 (medium)	Evidence of one or more Koalas within 2 km of the edge of the impact area within the last 10 years.		
	0 (low)	None of the above.		
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known Koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	**2:** Has forest, woodland or shrubland with emerging trees with 2 or more known Koala food tree species	The study area contains the following 12 species of Koala feed trees: ▪ Long-fruited Bloodwood (*Corymbia clarksoniana*) ▪ Dallachy's Gum (*Corymbia dallachiana*) ▪ Variable-barked Bloodwood (*Corymbia erythrophloia*) ▪ Carbeen (*Corymbia tessellaris*) ▪ Narrow-leaved Red Ironbark (*Eucalyptus crebra*) ▪ River Red Gum (*Eucalyptus camaldulensis*) ▪ Mountain Coolabah (*Eucalyptus orgadophila*) ▪ Poplar Gum (*Eucalyptus platyphylla*) ▪ Poplar Box (*Eucalyptus populnea*) ▪ Queensland Blue Gum (*Eucalyptus tereticornis ssp. tereticornis*) ▪ Black Tea Tree (*Melaleuca bracteata*) ▪ Yellow-barked Paperbark (*Melaleuca nervosa*).
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known Koala food tree present.		
	0 (low)	None of the above.		

Attributes and Scores from Koala Habitat Assessment Tool			Results of Desktop Analysis	
Attribute	**Score**	**Inland**	**Proposed Score**	**Comment**
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	**2:** Area is part of a contiguous landscape ≥ 1000 ha	Approximately 380.1 ha of potential Koala habitat occurs in the study area. The study area is part of a contiguous landscape of remnant riparian corridors and provides connectivity to other large tracts of remnant vegetation to the west, associated with the Isaac River and to the north and east associated with the Kerlong Range. However, connected corridors are generally restricted to narrow watercourses.
	+1 (medium)	Area is part of a contiguous landscape < 1000 ha, but ≥ 500 ha.		
	0 (low)	None of the above.		
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	**1:** The study area is likely to have some degree of dog threat present.	Dogs were recorded in the study area during the field survey and may pose a degree of threat to Koalas. Vehicles are unlikely to pose a significant threat to Koalas within the study area
	+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 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.		

Attributes and Scores from Koala Habitat Assessment Tool			Results of Desktop Analysis	
Attribute	**Score**	**Inland**	**Proposed Score**	**Comment**
Recovery value‡	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	**1:** Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the EPBC Act referral guidelines for the Koala	The creek lines in the study area have the potential to provide refuge habitat for Koalas as described in the EPBC Act referral guidelines for the vulnerable Koala (DotE 2014). These habitats are connected with larger remnants in the landscape.
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		
		TOTAL	**6**	**Decision: Habitat critical to the survival of the Koala—assessment of significance required.**

Appendix O

Summary of impacts table

Table O1: Vegetation and habitat proposed to be disturbed within the ecology study area[+]

Vegetation / Species	Conservation status		Total area in the ecology study area (ha)	Total area to be cleared (ha)
	Cw'lth Status[1]	State Status[2]		
Regional ecosystems				
11.3.2 Poplar Box alluvial woodland	-	Of concern	1.2	0.0
11.3.4 Queensland Blue Gum alluvial woodland	-	Of concern	0.5	0.0
11.3.25 Mixed eucalypt riparian woodland	-	Least concern	48.1	1.4
11.5.3 Poplar Box woodland	-	Least concern	105.2	80.1
11.5.8b Narrow-leaved Red Ironbark - Queensland Blue Gum woodland	-	Least concern	3.4	0.0
11.5.9 Narrow-leaved Red Ironbark woodland	-	Least concern	9.7	0.0
11.5.12 Clarkson's Bloodwood woodland	-	Least concern	142.2	36.2
11.7.2 Lancewood woodland	-	Least concern	14.6	0.0
11.8.5 Mountain Coolabah woodland	-	Least concern	11.8	0.9
11.9.7a Poplar Box - Dawson River Gum woodland	-	Of concern	8.5	3.7
Regional ecosystems within a defined distance of watercourses (50 m)				
11.3.2 (Poplar Box alluvial woodland)	-	Of concern	1.1	0.0
11.3.4 Queensland Blue Gum alluvial woodland	-	Of concern	0.1	0.0
11.3.25 Mixed eucalypt riparian vegetation	-	Least concern	38.9	0.7
11.5.3 Poplar Box woodland	-	Least concern	0.1	0.0
11.5.8b Narrow-leaved Red Ironbark - Queensland Blue Gum woodland	-	Least concern	0.04	0.0
11.9.7a	-	Of concern	0.7	0.0

Vegetation / Species	Conservation status		Total area in the ecology study area (ha)	Total area to be cleared (ha)
	Cw'lth Status[1]	State Status[2]		
Poplar Box - Dawson River Gum woodland				
Significant fauna habitat recorded in the study area				
Squatter Pigeon (southern subspecies) (*Geophaps scripta scripta*)	Vulnerable	Vulnerable	181.5	73.7
Greater Glider (*Petauroides volans*)	Vulnerable	Least concern	49.8	1.4
Ornamental Snake (*Denisonia maculata*)	Vulnerable	Vulnerable	0.0	0.0
Short-beaked Echidna (*Tachyglossus aculeatus*)	Not listed	Special least concern	345.2	122.3
Migratory fauna	Migratory	Special least concern	345.2	122.3
Significant fauna habitat likely to occur in the study area				
Koala (*Phascolarctos cinereus*)	Vulnerable	Vulnerable	380.1	124.8

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

1 EPBC Act status is only relevant if the RE meets the EPBC Act condition thresholds and key diagnostic criteria for the relevant TEC (TEC status current as at May 2016). Queensland REs are not individually listed under the EPBC Act, but may contribute to a TEC listed under the EPBC Act.

2 VM Act status for REs defined under the Regional Ecosystem Description Database (REDD) (Queensland Herbarium 2015b), NC Act status for threatened/near threatened species

Appendix P

EPBC Act significance assessment

Introduction

This appendix provides an assessment of the significance of impacts of the project, to listed species. Note, no threatened communities were found in the project site, and none were considered likely to occur.

The assessments have been conducted for each species, as per the criteria presented in Table 7. The assessments consider both the direct and indirect impacts of the project, and were undertaken in accordance with the EPBC Act Significant Impact Guidelines (DotE 2013).

The following species were assessed:

Threatened fauna

- Squatter Pigeon (vulnerable) –assessed in Section P1
- Greater Glider (vulnerable) –assessed in Section P2
- Koala (vulnerable) –assessed in Section P3

Migratory

The following migratory species are assessed in Section P4:

- Black-faced Monarch
- Rufous Fantail
- White-throated Needletail
- Fork-tailed Swift

Summary of proposed impacts

Clearing of vegetation constitutes the most substantial direct impact associated with the project. Overall, the project will result in the removal of approximately 122.3 ha of remnant vegetation, with further clearing in areas of non-remnant vegetation, some of which provides suitable habitat for various threatened species. Figure 18 illustrates the extent of remnant vegetation clearing associated with the project.

Remnant vegetation encompassed by the proposed clearing footprint for the project also supports areas of habitat for fauna species of conservation significance under the EPBC Act and NC Act.

Edge effects or fragmentation relevant to this assessment are considered to be those associated with effects of clearing on the edge of a retained community or habitat. Edge effects and other potential indirect impacts have not been quantified as part of this assessment as they are influenced by many factors in any given location, e.g. the likelihood and type of weed invasion, the type and severity of disturbance, the type of vegetation being impacted, the ongoing land use adjacent to the cleared edge. Typically edge effects in the form of nearby noise, dust deposition, increased light, wind shear, and weed invasion, is of a width in the order of tens of metres, and lesser for open woodland communities compared with dense vegetation.

Avoidance, mitigation and rehabilitation

The location of the coal resources dictates the area of disturbance for coal mines and in areas where clearing cannot be avoided, control measures will be implemented to minimise impacts on vegetation and habitat as far as practical. These measures are contained in the various management plans and procedures that are in place for the existing Isaac Plains Mine, and will be implemented for the Isaac Plains East project (refer to Section 8).

The following sections provide a profile of each species proposed to be impacted, the likely impacts after mitigation and an assessment of the significance of these impacts against the EPBC Act Significant Impact Guidelines, set out in the form of specific criteria or questions.

Some key concepts are important in assessing significance of impacts under the EPBC Act Significant Impact Guidelines as follows:

Establishing whether an 'important population' of a species listed under the EPBC Act is necessary in addressing the significant impact criteria for vulnerable species. 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.

Identifying 'critical habitat' is important in the assessment of significance of impacts under the EPBC Act Significant Impact Guidelines. Habitat critical to the survival of a species refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of other species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

These concepts are addressed where relevant, for each of the species.

P1: SIGNIFICANCE ASSESSMENT – Squatter Pigeon

The Squatter Pigeon (southern) (*Geophaps scripta scripta*) is listed as vulnerable under the Commonwealth EPBC Act and Queensland NC Act.

Distribution and habitat

This species is known to inhabit tropical dry, open sclerophyll woodlands and occasionally open savannah. It appears to favour sandy soil dissected with low gravelly ridges and is less common on heavy soils with dense grass cover. It is nearly always found in close association with permanent water (Higgins and Davies 1996). This species is also often recorded from areas that do not support remnant vegetation, but in these areas it seems to be associated with clear, disturbed sites such as tracks and stockyards (DotE 2016d); S. Marston Pers. obs.). These habitat areas are likely to provide breeding, foraging and dispersal habitat.

Presence in the study area

PRESENT

The Squatter Pigeon was recorded frequently throughout the study area during both survey periods (Figure 14). Recorded locations comprised both remnant and cleared areas, often along dirt vehicle tracks and usually within approximately 1 km of a dam. Water sources that still contained water at the time of the October 2015 (dry season) survey were considered permanent water points (typically farm dams) for the purpose of mapping Squatter Pigeon habitat.

Habitat mapping for the Squatter Pigeon (Figure 14) within the study area has been undertaken in accordance with the Red Hill Project EPBC Act approval definition. Habitat is categorised as follows:

- Suitable Habitat – grassy woodland habitat in REs on land zones 3, 5 or 7, which are either: within 1 km of a permanent water body; or within 1 km of a Queensland Government mapped wetland or ≥3rd order stream (DotE 2015a).
- Unsuitable Habitat – The Squatter Pigeon is considered unlikely to breed or forage elsewhere in the study area due to the proximity of water sources, the presence of unsuitable soils or groundcover. The Squatter Pigeon is noted as being less common in dense vegetation and vegetation with dense grass cover (Higgins and Davies 1996). This would largely preclude the cleared and disturbed areas due to the dominance of Buffel Grass in the groundcover layer. Therefore, all other areas of the study area are mapped as being generally unsuitable for this species except for dispersal purposes.

Based on this definition, there are 181.5 ha of suitable habitat for the Squatter Pigeon in the study area.

Importance of the population

The population of Squatter Pigeon that uses the study area is considered unlikely to be an important population for the following reasons:

- key source populations either for breeding or dispersal
  - This species is regularly recorded in the central Queensland region and remains common north of the Carnarvon Ranges. All sub-populations of this species occurring south of the Carnarvon Ranges in central Queensland are considered to be important sub-populations (DotE 2016k). The habitat types of the study area remain common throughout the region and the population of this species within the study area is therefore considered unlikely to be of particular significance for breeding or dispersal.
- populations that are necessary for maintaining genetic diversity
  - The population of the Squatter Pigeon within the Moranbah area is considered unlikely to be important in maintaining genetic diversity within the species. The inherent mobility of a bird species is likely to increase genetic exchange between individuals in comparison to less mobile species whose access to potential mates may be limited. Because of the relatively high rates of genetic exchange in more mobile species, it is less likely that any single population represents an important population for maintaining genetic diversity. The species is noted as being likely to comprise a single contiguous breeding population (DotE 2016k). It is therefore considered unlikely that the population of this species that occurs in the study area is important in maintaining genetic diversity of the species.
- populations that are near the limit of the species range.
  - The range of the Squatter Pigeon (southern) extends north to the Burdekin region and the species once occurred in southern New South Wales, although it has not been recorded in New South Wales for some time (DotE 2016k). The Moranbah area is well within the known distribution of this species. The northern limit of the Squatter Pigeon's (southern) range is considered to be the Burdekin region, approximately 200 km to the north of Moranbah. The species' range extents to the Border Rivers region of northern New South Wales. The area in which the study area is located is within the known distribution of this species.

EPBC Act Plans

- Conservation Advice: Approved Conservation Advice has been prepared for the Squatter Pigeon, which nominates conservation and management actions for the species. Conservation actions include survey and monitoring priorities, as well as research priorities.
- Recovery Plan: A recovery plan has not been prepared for the Squatter Pigeon, and the DotEE SPRAT Profile explains that one is not required as the Approved Conservation Advice provides sufficient direction to implement priority actions and mitigate against key threats.
- Threat Abatement Plan: Threat abatement plans are in place for the Squatter Pigeon for the threat of Cane Toads, tramp ants, rabbits and the European Red Fox.
- Referral Guideline: There are no referral guidelines for the Squatter Pigeon.

Known threats

The main threats to the Squatter Pigeon (southern) are as follows:

- loss of habitat due to clearing for agricultural or industrial purposes.
- degradation of habitat by grazing herbivores (i.e. sheep, cattle, rabbits).
- degradation of habitat through infestation by Buffel Grass and other improved pasture species
- excessive predation. Known predators include Feral Cats, Red Foxes, birds of prey, Dingos and snakes, but Feral Cats and Red Foxes are likely to be having the greatest impact upon Squatter Pigeon (southern) populations (DotE 2016k).

It is, however, noted that this species is common in the region and is commonly recorded during field surveys in the region.

Proposed impacts

The project would result in the removal of approximately 73.7 ha of habitat for the Squatter Pigeon (southern) mapped in the study area (Figure 19). Table P1 assesses the significance of this proposed impact.

Table P1: Assessment of significance of impacts for the Squatter Pigeon

Significance Criteria	**Assessment of significance**
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	The population of Squatter Pigeon using the study area is not considered to be an important population. The extent of clearing is unlikely to decrease the size of the population present given the extent of similar habitat available in the region.
Reduce the area of occupancy of an important population	The population of Squatter Pigeon using the study area is not considered to be an important population. The vegetation within the study area is commonly found throughout the surrounding Moranbah area and is not considered to be unique or particularly significant for the Squatter Pigeon. The Squatter Pigeon is also known to commonly occur in disturbed habitats. Therefore, due to the availability of similar habitat within the broader Moranbah region and the mobility of this avian species, the project is considered unlikely to affect the Squatter Pigeon's area of occupancy.
Fragment an existing important population into two or more populations	The population of Squatter Pigeon using the study area is not considered to be an important population. A portion of habitat on the western side of the study area is likely to be fragmented as a result of the project (Figure 19). However, the Squatter Pigeon is a highly mobile species and is known to disperse across cleared and degraded landscapes between preferred habitat areas. Therefore, it is considered unlikely that the population that occurs in the study area would be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	Squatter Pigeon habitat is relatively broad by definition, i.e. open-forests to sparse, open-woodland mostly dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species and within

Significance Criteria	Assessment of significance
	3 km of water bodies or watercourses (DotE 2016k). Therefore, very few areas, including the habitats in the study area, would be described as critical to the survival of the species. The habitat that is to be disturbed within the study area is not regarded as particularly significant or indicative of critical habitat due to the large amount of potential Squatter Pigeon habitat that exists in the surrounding Moranbah area. This habitat will continue to be available to the population of Squatter Pigeon that occurs within the study area. Given the mobility of avian species, access to habitat in the surrounding area should not be restricted.
Disrupt the breeding cycle of an important population	The population of Squatter Pigeon using the study area is not considered to be an important population. It is not known if the Squatter Pigeon breeds within the study area, however, given the relatively large number of birds recorded, it is considered likely. Standard industry recognised measures will be employed during the vegetation clearing stages of the project to minimise harm and disruption to animals and breeding places in accordance with the requirements of the Queensland Nature Conservation (Wildlife Management) Regulation 2006. This will reduce the risk and extent of disruption to the breeding cycle of the Squatter Pigeon in the study area.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Sub-populations in this region have not been identified as being of particular importance for the long-term survival or recovery of this species. This species is regularly recorded in the Moranbah area and is common in the region. The proposed clearing of 73.7 ha of suitable Squatter Pigeon habitat will not remove habitats, isolate habitats or degrade remaining habitats to the extent that the species is likely to decline. This is because clearing and disturbance is proposed to be gradual, habitat connectivity will be largely maintained and large tracts of similar suitable habitat occurs throughout the landscape.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The study area is located within a modified rural landscape where introduced plants and feral predators are present. Invasive and predatory species, including feral animals such as the Feral Cat and Domestic Dog have been identified as part of recent field surveys in the study area. Other species such as Foxes are likely to occur in the broader landscape and the study area is accessible to such species. However, this project will not result in invasive species becoming established in Squatter Pigeon habitat, as these species are already established throughout the wider landscape. Isaac Plains Mine has existing procedures in place for feral animal control, and these will be applied to the project (refer to Section 8).
Introduce disease that may cause the species to decline, or	Disease is not a known threat to this species. Therefore, the project is unlikely to introduce any disease that may cause the Squatter Pigeon to decline.
Interfere substantially with the recovery of the species.	This species is noted as 'remaining common north of the Carnarvon Ranges in central Queensland' (DotE 2016k) and is regularly recorded in the Moranbah area. Substantial areas of suitable habitat will remain within the local landscape. The

Significance Criteria	Assessment of significance
	Squatter Pigeon is known to occur in disturbed areas and is likely to continue occupying the study area during the life of the project. Therefore, it is considered unlikely the project will interfere substantially with the recovery of the species.
Conclusion	*The project is considered unlikely to result in a significant residual impact to the Squatter Pigeon as the species remains common in its northern distribution, the study area is unlikely to support an important population, and extensive similar habitat occurs elsewhere in the region.*

P2: SIGNIFICANCE ASSESSMENT – Greater Glider

The Greater Glider (*Petauroides volans*) is listed as vulnerable under the Commonwealth EPBC Act and least concern under the Queensland NC Act.

Distribution and habitat

The Greater Glider is a nocturnal species and uses tree hollows during the day to rest (van Dyck and Strahan 2008a). It may glide over distances of up to 100 m, however, it appears to have low dispersal ability and typically small home ranges of 1-4 ha. The species has an almost exclusive diet of eucalypt leaves and occasionally flowers or buds (TSSC 2016a van Dyck and Strahan 2008a). Although it is known to feed on a range of eucalypt species, in any particular area, it is likely to only forage on one or two species (van Dyck and Strahan 2008a).

The Greater Glider occurs in a range of eucalypt-dominated habitats, including low open forests on the coast to tall forests in the ranges and low woodland westwards of the Dividing Range. It does not use rainforest habitats (van Dyck et al. 2013 van Dyck and Strahan 2008a). This species favours taller, montane, moist eucalypt forests with relatively old trees and abundant hollows and a diversity of eucalypt species (TSSC 2016a).

Presence in the study area

PRESENT

This species was identified at five locations in the study area, along Smoky Creek and Billy's Gully in mixed eucalypt riparian woodland (RE 11.3.25) (Figure 15).

The approved conservation advice for this species (TSSC 2016a) indicates that taller, moist eucalypt forest with relatively old trees and abundant hollows and a diversity of eucalypt species is favoured by this species. Using this description and in consideration of the communities in which the Greater Glider was observed in the study area and in other surveys conducted throughout Central Queensland, the riparian and alluvial communities are considered to provide suitable habitat for this species. These communities are considered to provide the greatest availability of large old hollow-bearing trees and provide the greatest connectivity with larger patches of remnant vegetation in the landscape.

Habitat mapping for the Greater Glider (Figure 15) within the study area has been based on information contained in the TSSC conservation advice for the species, as well as the communities in which the Greater Glider was observed in the study area and in other surveys conducted throughout Central Queensland. Habitat is categorised as follows:

- Suitable Habitat – In line with TSSC conservation advice, remnant riparian and alluvial REs 11.3.2, 11.3.4 and 11.3.25 provide habitat.
- Unsuitable Habitat – The Greater Glider is considered unlikely to be present within other vegetation types in the study area as these lack

large, old hollow-bearing trees and a diversity of Eucalypt species. Therefore, these areas are mapped as being generally unsuitable for this species.

Based on this definition, there are 49.8 ha of suitable habitat for the Greater Glider in the study area.

Importance of the population

The population of Greater Gliders that uses the study area is considered unlikely to be an important population for the following reasons:

- key source populations either for breeding or dispersal
  - The habitat mapped for the Greater Glider within the study area is relatively small and narrow and is unlikely to support a large population. Larger watercourses and wider riparian corridors in the broader landscape are more likely to provide greater connectivity value and support larger populations, which would be more important for breeding and dispersal. Therefore, the study area is unlikely to support a key source population.
- populations that are necessary for maintaining genetic diversity
  - The population of Greater Gliders using the study area is not necessarily unique, large, isolated or genetically disjunct from any other Greater Gliders occurring in the region. Therefore, the population using the study area would not be considered necessary for maintaining genetic diversity.
- populations that are near the limit of the species range.
  - The study area is not at or near the limit of this species' range. The Greater Glider occurs throughout the eastern part of Australia and the study area is located more or less centrally within the known distribution of this species (TSSC 2016a).

EPBC Act Plans

- Conservation Advice: Approved Conservation Advice has been prepared for the Greater Glider, which recommends conservation and management actions for the species. The conservation advice also details threats to the species, and assigns consequence ratings to the threat.
- Recovery Plan: There is no Recovery Plan in place for the Greater Glider, however, the DotEE SPRAT Profile identifies that a Recovery Plan is required.
- Threat Abatement Plan: There are no threat abatement plans in place for the Greater Glider.
- Referral Guideline: There are no referral guidelines for the Greater Glider.

Known threats

The following key threats have been identified for the Greater Glider:

- habitat loss and fragmentation (through clearing and logging), causing loss of connectivity and large hollow-bearing habitat trees

- too intense or frequent fires causing population loss or declines
- climate change affecting habitat suitability and causing a range contraction
- increased predation by owls causing local extinctions (TSSC 2016a).

Proposed Impacts

The project would result in the clearing of approximately 1.4 ha of habitat for the Greater Glider in the study area (Figure 20). Table P2 assesses the significance of this proposed impact.

Table P2: Assessment of significance of impacts for the Greater Glider

Significance Criteria	Assessment of significance
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	The population of Greater Gliders using the study area is not considered to be an important population. The limited extent of clearing is unlikely to decrease the size of the population present given the limited clearing that is proposed (i.e. 1.4 ha) and the extent of similar habitat available in the region.
Reduce the area of occupancy of an important population	The population of Greater Gliders using the study area is not considered to be an important population. The Greater Glider is known to be abundant in riparian vegetation along the Isaac River and other waterways in the Moranbah region (S. Marston pers. obs.). Therefore, the removal of 1.4 ha of suitable habitat is considered unlikely to reduce the area of occupancy of this species within the local Moranbah area.
Fragment an existing important population into two or more populations	The population of Greater Gliders using the study area is not considered to be an important population. Although the width of clearing for the construction of haul roads for the project across Billy's Gully and the unnamed tributary of Smoky Creek (i.e. approximately 40 m) may affect dispersal to some degree, this species is known to glide distances of up to 100 m. In addition, these waterways are not the only dispersal corridor for this species in the region. It is anticipated that the Greater Glider would also make use of other riparian corridors in the area, such as Smoky Creek, which will not be impacted by the project. Furthermore, this species typically has small home ranges of 1-4 ha. Therefore, altering connectivity along this corridor within the study area is unlikely to isolate or fragment any populations.
Adversely affect habitat critical to the survival of a species	There is no published literature that indicates what habitat may be considered critical to the survival of the Greater Glider. Riparian habitats are likely to be favoured by this species due to the typically higher abundance, height and age of eucalypt trees. It is noted than in any one area the Greater Glider tends to feed on one or two species of Eucalypt (van Dyck and Strahan 2008b). Given past observations of this species nearly always being associated with riparian vegetation over several years and during several fauna surveys (S. Marston pers. obs.) in the Central Queensland region, it appears that the species favours River Red Gum and Queensland Blue Gum as food trees in the region. These species are present along the Smoky Creek and Billy's Gully habitats (i.e. RE 11.3.25) where the Greater Glider was recorded. There is no information to suggest the habitat proposed to be cleared is critical to the survival of this species or any more important than any other similar riparian or wetland habitat in the study area or surrounding areas.
Disrupt the breeding cycle of an important population	The population of Greater Gliders using the study area is not considered to be an important population. Nonetheless, clearing of approximately 1.4 ha of habitat is unlikely to disrupt the breeding cycle of the local population. This is because it is a relatively small area of clearing compared with the availability of habitat in the broader landscape and standard industry recognised measures will be employed during the vegetation clearing stages of the project to minimise harm and disruption to animals and breeding places in accordance with the

Significance Criteria	Assessment of significance
	requirements of the Queensland Nature Conservation (Wildlife Management) Regulation 2006. These measures will reduce the risk and extent of disruption to the breeding cycle of Greater Gliders in the study area.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed clearing and disturbance of 1.4 ha of Greater Glider habitat will not remove habitats, isolate habitats or degrade remaining habitats to the extent that the species is likely to decline. This is because large tracts of similar suitable habitat occurs throughout the landscape and the area proposed to be cleared is relatively small. Connectivity along Billy's Gully is unlikely to be affected by the project. A similar level of connectivity of the study area will be maintained with other large tracts of remnant vegetation to the north-east, associated with the Burton, Kerlong and Carborough Ranges. Riparian connectivity with the Isaac River is still evident to the east and south of the study area, south of the Peak Downs Highway. Therefore, it is considered unlikely that the species is likely to decline as a result of the impacts to connectivity along Billy's Gully.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The study area is located within a modified rural landscape where introduced plants and feral predators are present. Invasive species, including feral animals such as the Feral Cat and Domestic Dog have been identified as part of recent field surveys in the study area. Other species such as Foxes are also likely to occur in the broader landscape and the study area is accessible to such species. These existing threats will continue to be present throughout the study area during the life of the project. These types of predatory species are drawn to areas of disturbance to prey upon mammals and reptiles that are moving away from the disturbance area. Therefore, predation by feral animals is a risk to this species during and immediately after clearing activities. Predatory species are also attracted to the prey opportunities presented by cleared linear corridors, i.e. exposure of prey moving across cleared corridors. However, this project will not result in invasive species becoming established in habitat, as these species are already established throughout the wider landscape. Isaac Plains Mine has existing procedures in place for feral animal control, and these will be applied to the project (refer to Section 8).
Introduce disease that may cause the species to decline, or	There are no known pathogens or disease that may cause the Greater Glider to decline. However, the root rot fungus Phytophthora (*Phytophthora cinnamomi*) is known to affect the health of eucalypt species, which the Greater Glider is reliant upon as habitat. Phytophthora is known to occur in all states of Australia and is likely to be present in the landscape in which the study area is located. River Red Gum is thought to be tolerant of this fungus, although there is no published information for the Queensland Blue Gum. Vegetation most at risk to this fungus is thought to be in areas with average annual rainfall of >600 mm (O'Gara et al. 2005). The Moranbah region falls beneath this threshold (BoM 2016). Given the fungus is likely to be already within the local area and the Phytophthora threat to the Greater Glider is considered to be minor at this stage by the TSSC (TSSC 2016a), it is considered unlikely that

Significance Criteria	Assessment of significance
	the project will introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The project will result in clearing or disturbance of 1.4 ha of habitat. The Greater Glider is known to be abundant in riparian vegetation along the Isaac River and other waterways in the Moranbah region (S. Marston pers. obs.). The limited extent of clearing is considered unlikely to interfere substantially with the recovery of the Greater Glider as extensive similar habitat areas occur elsewhere in the local and regional landscape.
Conclusion	*Given that only a small area of habitat is proposed to be cleared, and habitat will remain in the broader landscape, the project is considered unlikely to cause a significant residual impact to the Greater Glider.*

P3: SIGNIFICANCE ASSESSMENT – Koala

The Koala (*Phascolarctos cinereus*) is listed as vulnerable under the Commonwealth EPBC Act and Queensland NC Act.

Distribution and habitat

This species is widespread in sclerophyll forest and woodland on foothills and plains on both sides of the Great Dividing Range from about Chillagoe, Queensland to Mt Lofty Ranges in South Australia (Menkhorst and Knight 2011).

Any forest or woodland containing species that are known Koala food trees, or shrubland with emergent food trees provides potential Koala habitat. Koalas are known to occur in modified or regenerating native vegetation communities, and are not restricted to remnant vegetation (DotE 2016f). The EPBC Act referral guidelines for the vulnerable Koala (DotE 2016f) defines define Koala food trees as species of the *Angophora,Corymbia*, *Melaleuca*, *Lophostemon* or *Eucalyptus* genera.

Presence in the study area

HIGH LIKELIHOOD OF OCCURRENCE

The Koala was listed as occurring in the region in database searches (Wildlife Online within 7 to 10 km of the study area). This species has been recorded in recent EIS field surveys undertaken in proximity to the study area, including:

- Integrated Isaac Plains Project EIS – the Integrated Isaac Plains study area was located approximately 8 km to the south of the study area (note this project has been withdrawn since the publication of the EIS)
- Moranbah South Project EIS – the Moranbah South study area is located approximately 4 km to the south of the study area
- Red Hill Project EIS – the Red Hill project site is located approximately 17 km to the north-west of the study area
- Caval Ridge Project EIS – the Caval Ridge ML is located approximately 11 km to the south-west of the study area.

The location of these mines and projects is shown on Figure 3.

The Koala was not identified in the study area during surveys. The EPBC Act referral guidelines for the vulnerable Koala (DotE 2014) explain, however, that "*Koalas do not necessarily have to be present*" for Koala habitat to be present. The definition of Koala habitat is based on the vegetation community present and the vegetation structure. Based on the habitat definitions contained in these guidelines and the records of the species from the region, the Koala has been assessed as having a high probability of occurrence. This rating is based on:

- The presence of suitable habitat within the study area, including riparian habitat, in the form of woodland vegetation that contains Koala food trees, as defined in the EPBC Act referral guidelines for the vulnerable Koala (DotE 2014).
- A connection between this habitat and habitat in the region, including through riparian corridors, where the Koala has been recorded. The Koala has

been recorded during field surveys undertaken for a number of other mining projects in proximity to the study area. The riparian vegetation within the study area provides a connection between these project sites and the Isaac Plains East Project.

- The Koala's ability to move between habitat areas, including its willingness to traverse cleared and disturbed areas in search of habitat (DotE 2016f).

Habitat mapping for the Koala (Figure 17) within the study area has been undertaken in accordance with the Red Hill Project EPBC Act approval definition. Habitat is categorised as follows:

- Suitable Habitat – any forest or woodland containing species that are Koala food trees, or any shrubland with emergent Koala food trees (i.e., trees of any of the following genera: *Angophora, Corymbia, Eucalyptus, Lophostemon, Melaleuca*).
- Unsuitable Habitat – Cleared areas, Brigalow and SEVT vegetation types are considered to be generally unsuitable habitat for the Koala.

All of the areas of remnant vegetation within the study area are considered to provide habitat for the Koala due to the presence of the Koala feed trees, namely:

- RE 11.3.2 – Carbeen (*Corymbia tessellaris*), Poplar Box (*Eucalyptus populnea*)
- RE 11.3.4 – Carbeen, Poplar Box, River Red Gum (*Eucalyptus camaldulensis* var. *obtusa*) and Queensland Blue Gum (*Eucalyptus tereticornis* subsp. *tereticornis*)
- RE 11.3.25 – Carbeen, Poplar Box, River Red Gum, Queensland Blue Gum, Long-fruited Bloodwood (*Corymbia clarksoniana*), Dallachy's Gum (*Corymbia dallachiana*), Narrow-leaved Red Ironbark (*Eucalyptus crebra*) and Black Tea Tree (*Melaleuca bracteata*)
- RE 11.5.3 – Poplar Box and Narrow-leaved Red Ironbark
- RE 11.5.8b – Poplar Box, Queensland Blue Gum, Long-fruited Bloodwood, Dallachy's Gum, Narrow-leaved Red Ironbark, Poplar Gum (*Eucalyptus platyphylla*) and Yellow-barked Paperbark (*Melaleuca nervosa*)
- RE 11.5.9 – Long-fruited Bloodwood, Dallachy's Gum and Narrow-leaved Red Ironbark
- RE 11.5.12 - Carbeen, Poplar Box, Long-fruited Bloodwood and Yellow-barked Paperbark
- RE 11.7.2 – Carbeen, Long-fruited Bloodwood and Narrow-leaved Red Ironbark
- RE 11.8.5 - Mountain Coolabah (*Eucalyptus orgadophila*) and Variable-barked Bloodwood (*Corymbia erythrophloia*)
- RE 11.9.7a – Poplar Box.

In addition, some areas of non-remnant habitat with emergent gums (such as Narrow-leaved Red Ironbark) are considered potential habitat for this species.

Figure 17 shows areas that have been mapped as suitable habitat. There are 380.1 ha of suitable habitat for the Koala in the study area.

The habitat within the study area has been assessed using the Koala Habitat Assessment Tool in the EPBC Act referral guidelines for the vulnerable Koala (DotE 2014). As outlined in Appendix N, the assessment of habitat in accordance with the tool indicates that the study area supports habitat critical to the survival of the Koala, with the main factors contributing to this assessment being:

- The habitat in the study area supports 12 potential feed tree species for the Koala
- The habitat in the study area is contiguous with more than 1,000 ha of habitat in the surrounding area
- The remnant vegetation along watercourses in the study area is likely to provide refuge habitat for the Koala, meaning that it may be important for achieving the interim recovery objectives for the Koala.

Importance of the population

The population of Koalas that may use the study area is considered unlikely to be an important population for the following reasons:

- key source populations either for breeding or dispersal
  - The Koala was not identified during field surveys, and no scats or scratches were observed. The study area is considered likely to support only a low density of Koalas. The suitable open woodland habitat is widespread throughout the broader landscape. Therefore, dispersal and breeding is likely to occur throughout the region and the study area is part of this broader regional habitat area.
- populations that are necessary for maintaining genetic diversity
  - Individual Koalas that may occur within the study area would be likely to belong to a larger meta-population of Koalas that would occur within areas of suitable habitat throughout the broader Moranbah region. Any population of Koalas using the study area would not necessarily be unique, large, isolated or genetically disjunct from any other Koalas occurring in the region. Therefore, any individuals using the study area would not be considered necessary for maintaining genetic diversity.
- populations that are near the limit of the species range.
  - The study area is not at or near the limit of this species' range. The Koala occurs throughout coastal and inlands areas of eastern Australia and the study area is located more or less centrally within the known distribution of this species (DotE 2014).

EPBC Act Plans

- Conservation Advice: Approved Conservation Advice has been prepared for the Koala, which provides priority research and management actions for the species, as well as specifying key threats.

- Recovery Plan: There is no Recovery Plan in place for the Koala, however, the DotEE SPRAT Profile identifies that a Recovery Plan is required.
- Threat Abatement Plan: There are no threat abatement plans in place for the Koala.
- Referral Guideline: The EPBC Act Referral Guidelines for the Vulnerable Koala outline important habitat for the Koala, and a habitat assessment tool is provided to assess if the habitat within the impact area is critical to the survival of the species. The guidelines also enable the proponent to undertake an initial assessment to determine whether a significant impact is likely on the species.

Known threats

Current known threats to the Koala include:

- agricultural land clearing, fragmentation and habitat degradation
- climate change altering temperatures, rainfall patterns and frequency of severe weather events
- ecosystem stresses affecting populations
- predation by the Domestic Dog
- disease and mortality caused by the Koala Retrovirus and Chlamydia
- localised overpopulation
- vehicle mortality (DotE 2016f).

Proposed impacts

The project would result in the removal of approximately 124.8 ha of habitat for the Koala in the study area (Figure 21). Table P3 assesses the significance of this proposed impact.

Table P3: Assessment of significance of impacts for the Koala

Significance Criteria	Assessment of significance
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 discussed above, the population of Koalas that may use the study area is considered unlikely to be an important population. The extent of clearing is unlikely to decrease the size of the population present given the extent of similar habitat available in the region and likely low density of Koalas in the local area.
Reduce the area of occupancy of an important population	Any population of Koalas using the study area would not be considered to be an important population. The project would not significantly impact the area of occupancy of the population of Koalas that occurs in the region as substantial areas of similar habitat exist. For example, Queensland Government RE mapping indicates there is in the order of 55,000 ha of similar habitat (i.e. the same REs that are considered to form habitat for the Koala in the study area) in the surrounding region (i.e. within a 25 km radius of the study area).
Fragment an existing important	The Koalas that may use the study area are not considered to be a part of an important population. Connectivity of habitat will

Significance Criteria	Assessment of significance
population into two or more populations	not be compromised as a result of the project and any population within the study area will not be fragmented, as Koalas are known to readily cross cleared areas.
Adversely affect habitat critical to the survival of a species	Based on advice in the EPBC Act referral guidelines for the vulnerable koala (DotE 2014), koala habitat in the study area is considered to be critical habitat (a score of 6) (refer Appendix N). It is proposed that 124.8 ha of critical habitat (with a score of 6) will be cleared or disturbed as a result of the project. Under the EPBC Act referral guidelines the significance of impacts to habitat with a score of 6 are assessed on a case by case basis, taking into account the factors listed in Figure 2 of the referral guidelines. The discussion below makes reference to these factors. The Koala is considered likely to occur at a low density within the study area, if it occurs at all. Line transects resulted in approximately 104.2 ha or approximately 27% of the 380.1 ha of suitable habitat within the study area being searched for Koalas without any animals or signs being recorded. The 124.8 ha of habitat proposed to be impacted is proposed to be completely cleared. However, connectivity of habitat will not be compromised as a result of the project and any population within the study area will not be fragmented, as Koalas are known to cross cleared areas and are not completely reliant on habitat corridors (DotE 2016f). Importantly, the project has been designed to avoid clearing of remnant vegetation where possible, and only involves very limited clearing of riparian vegetation which provides the highest value habitat for the koala on the study area. The riparian vegetation in the study area will therefore continue to provide connectivity to other areas of habitat beyond the study area.
Disrupt the breeding cycle of an important population	The Koalas that may use the study area would not be considered to be a part of an important population. Nonetheless, clearing of approximately 124.8 ha of habitat over approximately 7 years is unlikely to disrupt the breeding cycle of the local population. This is because this is a relatively small area compared the availability of habitat in the broader landscape and standard industry recognised measures will be employed during the vegetation clearing to minimise harm and disruption to animals and breeding places in accordance with the requirements of the Queensland Nature Conservation (Wildlife Management) Regulation 2006.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed clearing and disturbance of 124.8 ha of Koala habitat will not remove habitats, isolate habitats or degrade remaining habitats to the extent that the species is likely to decline. This is because the project will not sever connectivity with similar suitable habitat that occurs throughout the region and Koalas are known to disperse through cleared and modified landscapes. Connectivity with other large tracts of remnant vegetation to the north-north-east, associated with the Burton, Kerlong and Carborough Ranges and to the south-west with the Denham and Cherwell Ranges will not be substantially affected by the project. The project has been designed to avoid clearing of remnant vegetation were possible, and only involves very

Significance Criteria	Assessment of significance
	limited clearing of riparian vegetation which provides the highest value habitat for the koala on the study area. The riparian vegetation in the study area will therefore continue to provide connectivity to other areas of habitat beyond the study area. Furthermore, the Koala is likely to occur at only a low density within the study area, if it occurs at all. Prior to any clearing, a spotter catcher will undertake pre-clearing inspections to ensure any impacts to this species is limited. Therefore any impact to habitat is not likely to impact the species to the extent that it is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The study area is located within a modified rural landscape where introduced plants and feral predators are present. Invasive species and feral animals such as the Feral Cat and Domestic Dog have been identified as part of field surveys in the study area. Other species such as Foxes are also likely to occur in the broader landscape. These predatory species already pose a risk to the Koala in the habitat areas present and the project is unlikely to increase this threat.
Introduce disease that may cause the species to decline, or	Three viruses are known to affect Koalas in the wild, Chlamydia and Koala Retrovirus (KoRV-A and KoRV-B). It is known that Chlamydia is a sexually transmitted disease in Koalas, however, how the Retrovirus is spread contagiously is unknown. Studies have shown that 100% of Koalas in the wild have the Retrovirus, and the majority of Queensland and New South Wales populations are infected with Chlamydia (Hanger and Loader 2009). Stress has been suggested to exacerbate the effects of disease on Koala populations in more populated areas. However, the project is not considered to present a significant mechanism, whereby the clearing of habitat would result in the introduction or increase the prevalence of these diseases in the local Koala population. This is because of the extensive area of habitat in the landscape and the likely low density of Koalas using the study area as evidenced by the lack of traces of this species (e.g. scats) recorded during the targeted field surveys. Therefore, the project is considered unlikely to introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The project will result in clearing or disturbance of 124.8 ha of Koala habitat. However, if the Koala does occur within the study area it is considered to be present at low densities, if at all, as line transects resulted in the survey of approximately 27% of suitable habitat, without an animal being recorded. A large area of similar habitat will remain within the surrounding area with approximately 55,000 ha of similar habitat (i.e. the same REs that are considered to form habitat for the Koala in the study area) within a 25 km radius of the study area. As stated in the EPBC Act referral guidelines, riparian vegetation is considered to be important for the recovery of the species. The project has been designed to avoid clearing of remnant vegetation were possible, and involves only very limited clearing of some areas of riparian vegetation which provides the highest value habitat for the koala in the study area. The riparian vegetation in the study area will therefore continue to provide

Significance Criteria	Assessment of significance
	connectivity to other areas of habitat beyond the study area. As discussed above, the project is not likely to increase koala fatalities due to dog attacks or vehicle strike, nor will it facilitate the introduction or spread of disease. Further, the project will not create a barrier to movement to or between critical habitat, given the project has been designed to avoid clearing of remnant vegetation where possible, and only involves very limited clearing of riparian vegetation which provides the highest value habitat for the koala on the study area. Therefore the project is considered unlikely to substantially interfere with the recovery of the Koala in the broader Moranbah region.
Conclusion	*As the population of Koalas that may occur within the study area is not considered to be an important population, and habitat will remain in the broader landscape, the project is considered unlikely to cause a significant impact to the Koala.*

P4: SIGNIFICANCE ASSESSMENT – Migratory birds

Habitat occurs throughout the study area for the four migratory birds identified or considered to potentially occur. The study area provides foraging habitat but is unlikely to provide breeding habitat for any migratory species. In the case of the Fork-tail Swift and White-throated Needletail, these species are more likely to overfly and forage above the study area rather than use on-ground habitats.

All remnant vegetation in the study area potentially provide habitat, to some extent, for these species and are preferred over cleared or heavily disturbed areas due to the structural diversity of habitats in remnant areas. However, cleared areas may provide foraging habitat for the White-throated Needle-tail and Fork-tailed Swift as these are predominantly aerial species. Remnant habitats comprise 345.2 ha within the study area.

Two key concepts are important in assessing the significance of impacts against the EPBC Act Significant Impact Guidelines. They are defined below.

Important habitat

Determining if an area of 'important habitat' for a migratory species listed under the EPBC Act occurs within the impact area is necessary in addressing the significant impact criteria for migratory species. Important habitat for a migratory species is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecological significant proportion of the population of the species, and/or
- habitat that is of critical importance to the species at particular life-cycle stages, and/or
- habitat utilised by a migratory species which is at the limit of the species range, and/or
- habitat within an area where the species is declining (DotE 2013).

It is considered unlikely that the study area provides important habitat for any migratory species due to:

- there being a relatively small number of individuals observed, i.e. less than 0.1% of the population of each species (DotE 2015b)
- the extent of agricultural clearing on alluvial flats adjacent to watercourses, significantly narrowing these riparian habitats
- the woodland habitat in the study area lacking dense and wet habitat understory features preferred by the Black-faced Monarch and Rufous Fantail
- vegetation within and adjacent to the study area being relatively fragmented
- the availability of larger more intact remnant landscapes to the north-east and south-west of the study area associated with the Isaac River, Denham, Peak, Carborough and Kerlong Ranges, which are likely to be more important habitat for migratory species.

Ecologically significant proportion

An ecologically significant proportion of a migratory species will differ between species, however, the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates) should be considered in evaluating this (DotE 2013).

The study area is unlikely to provide important habitat for any migratory species. It is also unlikely to support an ecologically significant proportion of the population of a migratory species, as this would have been evident as a result of seasonal surveys undertaken for the project. There was no evidence of important habitat areas, roost sites or other wetland features that could be used by large numbers of birds.

Known threats

There are no significant threats to the White-throated Needletail and Fork-tailed Swift in Australia, however the following are potential threats to the Black-faced Monarch and Rufous Fantail:

- invasive vines in riparian habitat, e.g. Rubber Vine.
- fragmentation and loss of core moist forest breeding habitat through land clearing and urbanisation
- predation or competition by the Feral Cat (*Felis catus*) and Black Rat (*Rattus rattus*) (DotE 2016h, 2015b).

Proposed impacts

Approximately 122.3 ha of remnant vegetation is proposed to be cleared within the study area (Figure 18). Table P4 assesses the significance of this impact on migratory birds.

Table P4: Assessment of significance of impacts for migratory birds

Significance Criteria	Assessment of significance
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;	The study area is unlikely to provide important habitat for a migratory species, therefore, important habitat will not be substantially modified, destroyed or isolated by the project. Additionally, the proposed clearing of 122.3 ha falls beneath the suggested thresholds for a significant impact for the relevant species in the Draft referral guidelines for 14 birds listed migratory under the EPBC Act (DotE 2015b).
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	The study area is unlikely to provide important habitat for a migratory species. Therefore, an invasive species, that is harmful to a migratory species, will not become established in important habitat as a result of the project.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant	An ecologically significant proportion of the population of a migratory species is considered unlikely to occur in the study area. Therefore, the project will not seriously disrupt the lifecycle of an ecologically

Significance Criteria	Assessment of significance
proportion of the population of the migratory species.	significant proportion of the population of a migratory species.
Conclusion	*The project will not cause a significant residual impact to migratory species listed under the EPBC Act.*

Appendix Q

Terrestrial MNES and MSES likely to require environmental offsets

Table Q1: Terrestrial MNES and MSES likely to require environmental offsets

Protected Matter	Presence in the study area	Potential project impacts	Offsets proposed under the EPBC Act	Offsets proposed under EO Act	Terrestrial Ecology Report section
MNES Only					
• **None**					
Dual Listed MNES and MSES					
• **None**					
MSES Only					
• **Regulated vegetation - of concern REs**					
RE 11.9.7a (sparse structure)	8.5 ha	Clearing 3.7 ha	Not an MNES	Yes – Offsets are required under the EO Act for significant residual impacts, i.e. clearing greater than 2.0 ha of remnant of concern RE with a sparse structure+	Sections: ▪ 5.2.3 ▪ 7.2.1 ▪ Appendix K ▪ Appendix O
• **Watercourse REs – Within defined distance to VM Act watercourses**					
11.3.25 (mid-dense structure)	38.9 ha	Clearing 0.7 ha for the construction of haul road connections (i.e. linear infrastructure)	Not an MNES	Yes – Offsets are required under the EO Act for significant residual impacts, i.e. clearing for linear infrastructure of greater than 10 m wide in a remnant RE with a mid-dense structure within the defining distance of a watercourse+	Sections: ▪ 5.2.3 ▪ 7.2.1 ▪ Appendix K ▪ Appendix O

+ As advised in the SRI Guideline (EHP 2014a)

Appendix R

EO Act significance assessments

Introduction

Database searches and desktop review indicated the potential for various NC Act listed flora and fauna species to occur in the study area.

Two NC Act listed threatened fauna species are considered to have suitable habitat within the study area, namely the Squatter Pigeon (southern subspecies), and Koala. These species are also listed under the EPBC Act, and have been assessed against the EPBC Act Significant Impact Guidelines 1.1: Matters of National Environmental Significance (DotE 2013) in Appendix P.

The Short-beaked Echidna was the only special least concern fauna species (non-migratory) recorded in the study area that is not also listed under the provisions of the EPBC Act.

This appendix provides an assessment of the significance of impacts of the project to the Short-beaked Echidna against the Queensland Environmental Offset Policy Significant Residual Impact Guideline (EHP 2014a). The Short-beaked Echidna is a non-migratory, special least concern species listed under the NC Act.

Special least concern migratory species are not MSES under the EO Act and therefore have not been assessed against these Queensland guidelines.

R1: SIGNIFICANCE ASSESSMENT – Short-beaked Echidna

The Short-beaked Echidna is listed as special least concern under the Queensland NC Act.

Habitat and distribution

The Short-beaked Echidna occurs in almost all terrestrial habitats except intensively managed farmland. It shelters in logs, crevices, burrows or piles of litter and feeds on ants, termites and other soil invertebrates, particularly beetle larvae (Menkhorst and Knight 2011).

Presence in the study area

The Short-beaked Echidna was recorded at three locations in cleared and vegetated areas in the study area. While this species is likely to use all areas of the study area for dispersal, remnant vegetation communities are considered to provide more favourable habitat due to the presence of foraging resources such as hollow logs and leaf litter.

Approximately 345.2 ha of foraging habitat is present in the study area (Figure 18).

Known threats

The likely predators of the Short-beaked Echidna area Feral Cats, Foxes, Domestic Dogs and Goannas (NPWS 1999).

Proposed impacts

The project will result in the removal of approximately 122.3 ha of Short-beaked Echidna habitat within the study area (Figure 18). Despite this reduction in habitat, connectivity to retained habitat and adjoining vegetation communities will not be substantially changed in the local landscape. Table R1 provides an assessment of the significance of these impacts against the Queensland Significant residual impact guidelines

Table R1: Assessment of significance of impacts for the Short-beaked Echidna

Significance Criteria	Assessment of significance
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	Approximately 122.3 ha of habitat formed by remnant vegetation is proposed to be cleared as part of the project. As Short-beaked Echidna habitat is widespread in the region and this species does not have specific habitat requirements, this clearing is unlikely to lead to a long-term decrease in the local population.
A reduced extent of occurrence of the species; or	Short-beaked Echidna habitat is proposed to be cleared as part of the project. However, the reduction of 122.3 ha of habitat is considered unlikely to affect the ability of the species to persist in the local area because of the extent of habitat that will remain and their broad habitat requirements. Therefore, the extent of occurrence of this species is unlikely to be reduced as

Significance Criteria	Assessment of significance
	a result of the project.
Fragmentation of an existing population; or	Connectivity of habitat will not be substantially altered as a result of the project as this species is known to use disturbed and cleared areas (Figure 18). As the Short-beaked Echidna is a mobile species the local population is unlikely to be fragmented due to the proposed clearing for the project.
Result in genetically distinct populations forming as a result of habitat isolation; or	As the local population is unlikely to be fragmented or become isolated, the gene flow within the local population is unlikely to be affected by the project.
Disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.	Standard industry recognised measures will be employed during the vegetation clearing stages of the project to minimise harm and disruption to animals and breeding places in accordance with the requirements of the Queensland Nature Conservation (Wildlife Management) Regulation 2006. This will reduce the risk and extent of disruption to the breeding cycle of the Short-beaked Echidna in the study area.
Conclusion	*Given the relatively small area of habitat proposed to be cleared as part of the project, the broad habitat requirements and mobility of the species, it is not likely that the project will have a significant residual impact on the Short-beaked Echidna.*

Appendix S

Output of Landscape Fragmentation and Connectivity Tool

IPE CONNECTIVITY - LOGFILE - 20160727.txt

Department of Environment and Heritage Protection (DEHP)
Landscape Fragmentation and Connectivity (LFC) Tool version 1.4 LOGFILE
Process started at 26-07-2016 12:23:29 AM
Python version: 2.7.10 (default, May 23 2015, 09:40:32) [MSC v.1500 32 bit (Intel)]
Arcpy version: 10.4.1
Username: Administrator

INPUT PARAMETERS
Output Workspace: C:\20160721 - CONNECTIVITY\07 OUTPUT\DP_EHP_LFC_TOOL\Output
Threshold lookup table: C:\G200 - CONNECTIVITY_SOFTWARE\LFC_data.gdb\tbl_Regional_frag_local_threshold
Remnant cover layer: C:\20160721 - CONNECTIVITY\06 FINAL VEG\IPE FINAL VEG - AMGZ55.shp
Remnant cover layer edited: True
Regional buffer extent: 20 kilometres
Local buffer extent: 5 kilometres
Impact layer: C:\20160721 - CONNECTIVITY\03 DISTURBANCE\IPE DISTURBANCE - AMG55.shp
layer projection: AGD_1984_AMG_Zone_55
Raster cell resolution for analysis: 10 metres
Edge Width: 50 metres
(The distance from non-remnant landscapes through to the core ecosystem - the edge of remnant ecosystems)
Default projection: C:\G200 - CONNECTIVITY_SOFTWARE\scripts\QLD Albers Equal Area Conic.prj

00:23:29 Checking out the spatial analyst tool - required for LFC

00:23:29 _____BEGINNING LANDSCAPE FRAGMENTATION AND CONNECTIVITY ANALYSIS_____

00:23:29 This tool will categorise the landscape into:
{0: 'non-rem', 1: 'patch', 2: 'edge', 3: 'perforated', 4: 'core (< 100 hectares)', 5: 'core (100-500 hectares)', 6: 'core (> 500 hectares)'}

00:23:29 Deleted existing .img files
00:23:50 Deleted existing files in output folder
00:23:51 Deleted existing pre-impact file geodatabase
00:23:55 Deleted existing post-impact file geodatabase
00:23:58 Copying across impact site feature(s) and calculating area in hectares (AreaHA)
00:23:58 Making a local copy of the impact site
00:23:59 Preparing remnant cover layer for analysis
00:24:01 Created regional scale buffer of 20 kilometres
00:24:03 Created local scale buffer of 5 kilometres
00:24:09 Clipped the remnant cover to the regional buffer extent
00:24:10 Unioned the pre impact remnant layer with the impact site
00:24:12 Attributed the impact area as non-remnant
00:24:13 Categorised the cover attributes in clip_remcover_pre.shp ready for raster conversion
00:24:21 Converted clip_remcover_pre.shp to raster

00:24:22 Categorised the cover attributes in clip_remcover_post.shp ready for raster conversion

Page 1

IPE CONNECTIVITY - LOGFILE - 20160727.txt

00:24:31 Converted clip_remcover_post.shp to raster

00:24:31 Run Landscape fragmentation analysis on the pre impact regional landscape

NATURALLY VEGETATED AND CLEARED LAND BEING EXTRACTED FROM LAND COVER
IDENTIFICATION OF CORE, PATCH, EDGE AND PERFORATIONS
COMBINING FRAGMENTATION CLASSES
CLASSIFYING CORE FOREST PATCHES BY AREA
COMPOSING FINAL FRAGMENTATION MAP
COMPOSING FINAL FRAGMENTATION MAP
(FRAGMENTATION CALCULATION TIME WAS 3.7 MINUTES)

00:28:14 Run Landscape fragmentation analysis on the post impact regional landscape

NATURALLY VEGETATED AND CLEARED LAND BEING EXTRACTED FROM LAND COVER
IDENTIFICATION OF CORE, PATCH, EDGE AND PERFORATIONS
COMBINING FRAGMENTATION CLASSES
CLASSIFYING CORE FOREST PATCHES BY AREA
COMPOSING FINAL FRAGMENTATION MAP
COMPOSING FINAL FRAGMENTATION MAP
(FRAGMENTATION CALCULATION TIME WAS 3.8 MINUTES)

Extracting a local subset of lfc_regional_pre_impact
Extracting a local subset of lfc_regional_post_impact

Collating pre and post impact statistics and trigger assessment
00:32:17 Summarising area statistics for: lfc_localmsk_pre_impact
00:32:17 Summarising area statistics for: lfc_localmsk_post_impact
00:32:17 Summarising area statistics for: lfc_regional_pre_impact
00:32:17 Summarising patch count for lfc_localmsk_pre_impact
00:32:20 Summarising patch count for lfc_localmsk_post_impact

Analysing impact on Connectivity Areas

SIGNIFICANCE TEST ONE

The regional total area is 161988.34
The regional extent of core remnant is 56780.45
The regional extent of core remnant is 35.05 percent
This level of regional fragmentation sets a local impact threshold of: 10.0 percent

The table below lists the local impact thresholds for categories of regional core remnant extent:

REGIONAL CORE CATEGORY	LOCAL IMPACT THRESHOLD
< 10	2.0
10 - 30	5.0
30 - 50	10.0
50 - 70	20.0
70 - 90	30.0
>90	50.0

Area of core at the local scale (pre impact): 3773.88
Area of core at the local scale (post impact): 3661.63
Percent change of core at the local scale (post impact): 2.97

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IPE CONNECTIVITY - LOGFILE - 20160727.txt

SIGNIFICANCE TEST TWO

The number of core remnant areas occurring on the site: 2
The number of core remnant areas remaining on the site post impact: 2
(Only core polygons greater than or equal to 1 hectare are included)

RESULT

00:32:27 This analysis has determined any impact on connectivity areas is NOT significant
(A significant reduction in core remnant at the local scale is False OR a change from core to non-core remnant at the site scale is False)

The significance table has been written to: ..\main_output\lfc_significance_assessment.csv
The local scale summary table has been written to: ..\main_output\lfc_local_scale_summary.csv
The site scale summary table has been written to: ..\main_output\lfc_site_scale_summary.csv
GIS layer files copied into folder \lyr_file within the project folder.
View layers in ArcMAP using..\C:\20160721 - CONNECTIVITY\07 OUTPUT\DP_EHP_LFC_TOOL\Output\lyr_file\lyr_file\Connectivity Area Impact Assessment.lyr

Please scrutinise the output tables and spatial layers to confirm the desktop modelling of connectivity area impact

This analysis used an edited version of the Regulated Vegetation layer.

00:33:01 _____COMPLETED LANDSCAPE FRAGMENTATION AND CONNECTIVITY ANALYSIS_____

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Appendix C

Offset Area Habitat Quality Ecological Report

Ecological Assessment Report

Mount Spencer Station Offsets Investigation Area

BASE/

Client: Stanmore Coal Pty Ltd

Reference: J0053

Document Control

Title:	Mount Spencer Ecological Assessment Report
Address:	Mount Spencer Property (Lot 4 SP277438)
Job Number:	J0053 Biodiversity Offset Management Plan (Stanmore)
Client:	Stanmore IP Coal Pty Ltd

Document Issue

Issue	Date	Prepared By	Reviewed By
DRAFT 1	2/9/2020	IW/LS	CS
DRAFT 2	6/10/2020	JH/IW	CS
FINAL DRAFT	23/10/2020	JH	CS

Contents

1.0 Introduction

1.1 Project Background

The Isaac Plains Complex (IPC) is an operating metallurgical open cut coal mine located approximately 5 km northeast of Moranbah in Central Queensland (see Figure 1). Mining operations are carried out under an existing State Government approved environmental authority (EA) and occurs across several approved mining leases (ML), namely ML 70342, ML 700016, ML 700017, ML 700018 and ML 700019.

The Isaac Plains Mine (IPM) originally commenced operation in 2006 and produced approximately 2.8 million tonnes per annum (Mtpa) of coking coal for export to international markets. The IPM was put into care and maintenance by the previous owners and was acquired by Stanmore IP Coal Pty Ltd (Stanmore) in late 2015, who recommenced operations from the existing open cut pit. In 2018, approval was received from State and Commonwealth Governments for the Isaac Plains Extension (IPE) project which involved mining on ML 700016, ML 700017, ML 700018, ML 700019. State and Commonwealth approvals for the IPE Project limited the disturbance footprint of proposed activities within the approved mining leases.

Additionally, the Isaac Plains East Extension (IPEE) is immediately adjacent to the existing IPE mining area and involves additional disturbance areas, an increase to the total production volume and extends the duration of mining. The extension involves the expansion of the IPE open cut pits to the east which is estimated to extend the mining life by approximately four years. Additional supporting infrastructure such as haul roads, power lines and water management infrastructure are required to facilitate the extension and an existing upgrade to the CHPP and associated coal stockpiling areas within the IPM is proposed.

Stanmore Coal also proposes to develop the Isaac Downs Project, an open cut metallurgical coal mine expected to produce up to approximately 35Mt of ROM coal over 16 years. Isaac Downs is located adjacent to the IPE and IPEE projects and is expected to extend the life of the company's assets at the Isaac Plains Complex. The project will limit its footprint by using Stanmore's existing coal processing plant and rail infrastructure.

For these projects, offsets are required for significant residual impacts to Matters of National Environmental Significance (MNES) including the Koala (Phascolarctos cinereus), Greater Glider (Petauroides volans), and Squatter Pigeon (southern) (Geophaps scripta scripta). Stanmore proposes to legally secure offsets for impacts to the Koala, Greater Glider and Squatter Pigeon within Lot 4 SP277438 which is part of Mt Spencer Station (Figure 2) as outlined in

Table ***1*** in Section 2.2. It is the intent of Stanmore to collocate all required offsets within an area of 2900.68 ha within Mount Spencer Station.

Base Consulting Group (Base) was commissioned by Stanmore IP Coal Pty Ltd (Stanmore) to prepare this ecological assessment report to support the offsets process and to outline the extent of habitat (in hectares) and habitat condition for the Koala, Greater Glider and Squatter Pigeon within the Mount Spencer Station. Data collected during the ecology surveys will provide the baseline habitat quality information to inform the Projects Offset Area Management Plans (OAMP).

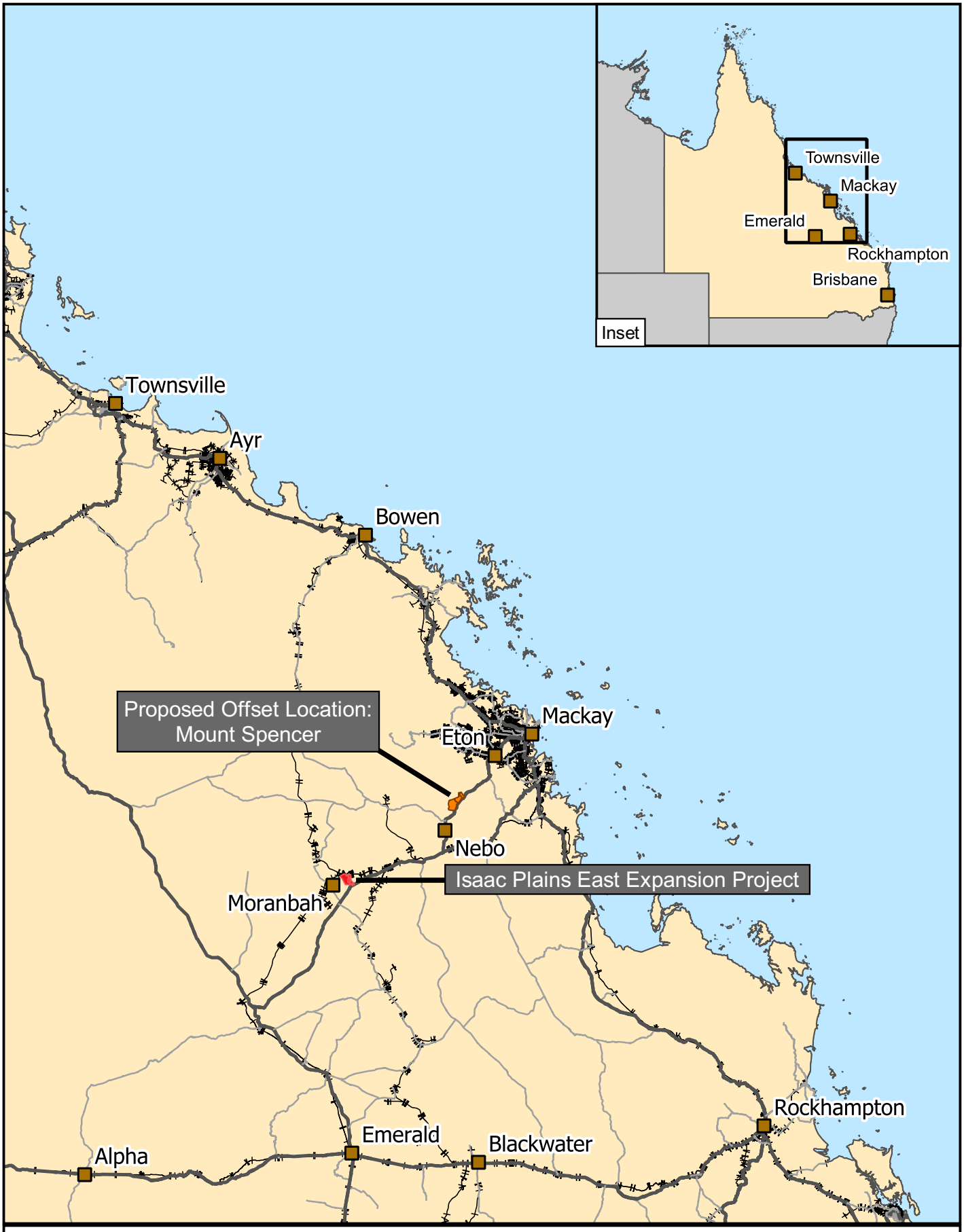
1.2 Scope and Purpose of Report

This ecological assessment report was prepared as a requirement of the Commonwealth approval conditions (for the IPE) and the Commonwealth approval process for the IPEE and ID projects. The purpose of the baseline survey was to measure the habitat quality of the field-verified vegetation communities within the proposed offset investigation area (herein referred to as the 'study site'). This report identifies the ecological values of the proposed offset site, relevant to MNES and presents the results of habitat quality assessments for threatened species and habitat. This information will be incorporated into the Project OAMP.

1.3 Location

The offset investigation area is located on Lot 4 SP277438 which forms part of the larger Mount Spencer Station. Lot 4SP277438 encompasses 4,810 ha of which 4,693 ha is currently mapped as remnant vegetation. Further, Mt Spencer Station (inclusive of Lot 4) covers 22,712 ha which includes approximately 20,190 ha of remnant vegetation. Lot 4 is approximately 105 km to the northeast of the IPEE project and lies within the Isaac Regional Council Local Government Area.

Lot 4 straddles the Brigalow Belt and Central Queensland Coast bioregions with the offset investigation area also straddling the Clarke-Connors ranges (in the western section) and the Nebo -Connors Ranges (in the eastern section). The offset investigation area is located in the central and northern section of Lot 4 SP277438 within the larger Mount Spencer Station (Figure 2).



0 30 60 km

Scale @ A3: 1 : 2500000
Date: 19/10/2020
Drawn: Josh T

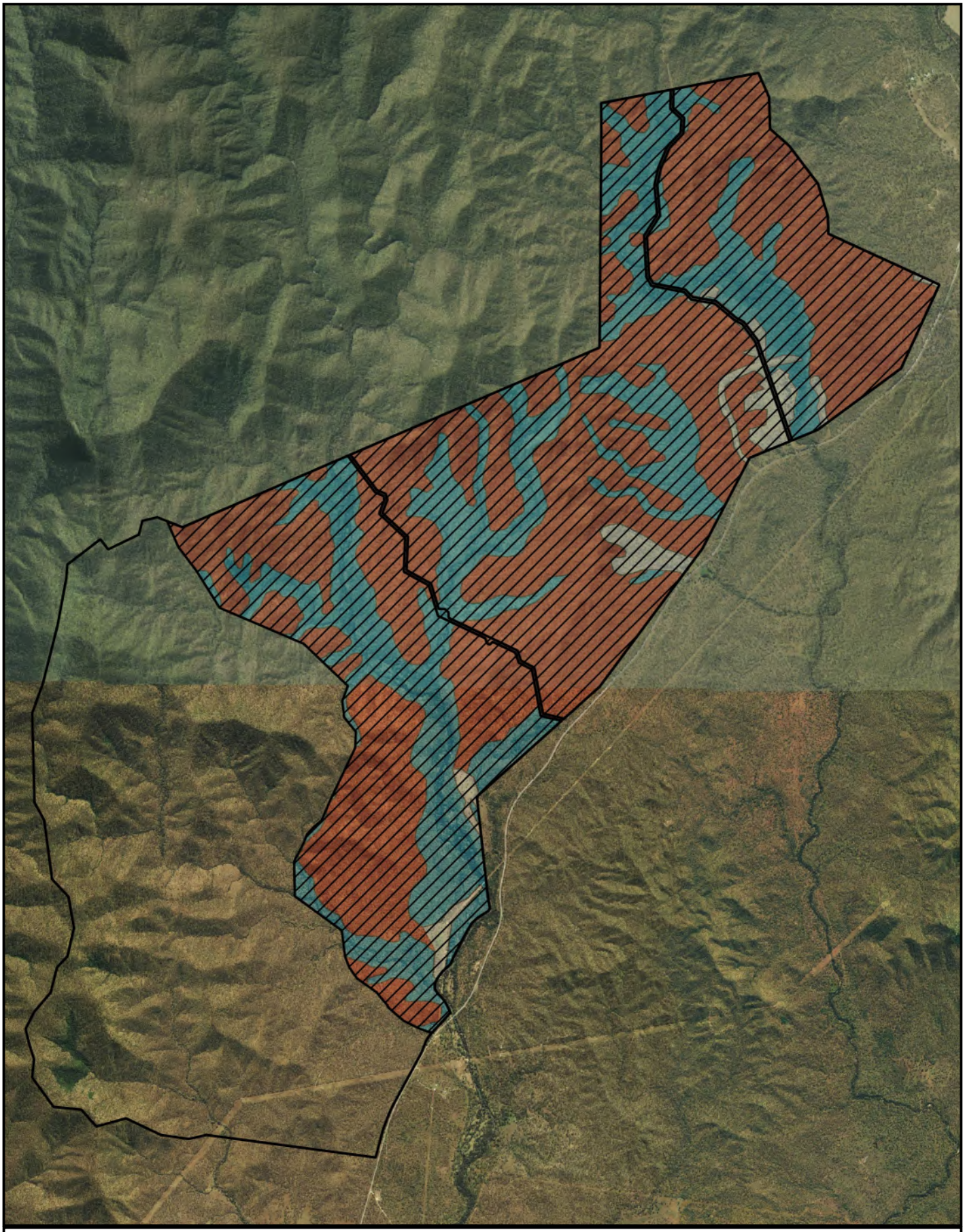
DATA SOURCE
BASE CONSULTING GROUP 2020; QSPATIAL 2020; The State of Queensland (Department of Natural Resource and Mines) 2020;

Figure 1: Mine and Proposed Offset Site Context

Legend

- Towns
- Highways
- Roads
- Rail Network
- Isaac Plains East
- Mount Spencer (Lot 4SP277438)

BASE/



0 500 1000 1500 m

Scale @ A3: 1 : 55000
Date: 19/10/2020
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2020; QSPATIAL 2020; The State of Queensland (Department of Natural Resource and Mines) 2020;

Figure 2: Mount Spencer Offset Investigation Area

Legend

- Lot 4 Property Boundary
- Offset Investigation Area

Field Verified Regional Ecosystem

- 11.12.1
- 11.3.4
- Non-Remnant

BASE/

2.0 Offset Requirements and Offset Area

Under the Environment Protection and Biodiversity Conservation 1999 (EPBC Act) Environmental Offsets Policy, offsets are required where a residual impact is likely to occur after avoidance, mitigation and management measures have been undertaken. For this project, offsets for residual impacts are to be legally secured for the MNES in Table 1.

2.1 Policy Principles

The EPBC Act Environmental Offsets Policy (October 2012), has five key aims that involve:

- Ensuring the use of offsets are efficient, effective, timely, transparent and scientifically robust;
- Providing all stakeholders with greater certainty on how offsets are determined and provided;
- Delivering improved environmental outcomes;
- Outlining the appropriate nature and scale of offsets; and
- Providing guidance on acceptable offsets and their delivery.

The Policy also provides eight key principles that are applied in determining the suitability of offsets. The principles relevant to the ecological assessment are as follows.

- Deliver an overall conservation outcome that improves or maintains the viability of the MNES in question;
- Be primarily built around direct offsets but may also include other compensatory measures;
- Be in proportion to the level of statutory protection that applies to the MNES;
- Be of a size and scale proportionate to the residual impacts on the protected matter;

Considering the above policy principles and the offsets required, ecological assessments have been undertaken on Mount Spencer Station to assess the site's potential as an offset area.

Mount Spencer Station has approximately 4,693 ha of remnant vegetation that has the potential to provide offsets for impacts to the MNES.

2.2 Summary of Project Impacts

Potential direct and indirect impacts within and adjacent to the IPE, IPEE and ID projects has been described in the various approval documents. These impacts include the direct loss of native vegetation, habitat and resources as a result of vegetation clearing within the Project footprint. The area of direct impact encompasses potential habitat for three (3) MNES protected under the EPBC Act. The potential impacts on these environmental values are summarised in Table 1.

Offsets are required for the three (3) MNES to account significant residual impacts as a result of the Project. In accordance with the EPBC Environmental Offsets Policy, it is necessary to assess the quality of these areas to accurately calculate the offset obligations.

Table 1 MNES impacted by the Project for which offsets will be sourced from the offset investigation area

MNES	EPBC Act status	Impact area requiring offsets (ha)		
		IPE	IPEE	ID
Koala *(Phascolarctos cinereus)*	Vulnerable	125	207.8	138
Greater Glider *(Petauroides volans)*	Vulnerable	125	207.8	68
Squatter Pigeon (Southern) *(Geophaps scripta scripta)*	Vulnerable	74	117.1 (breeding) 63.6 (foraging)	246

3.0 Methodology

3.1 Approach

A combined desktop and field-based program was undertaken to determine the habitat quality of the offset investigation area.

3.2 Desktop Assessment

3.2.1 Literature Review

The following literature was reviewed as part of the desktop assessment for the Survey Area.

- Isaac Plains East Project Habitat Quality Assessments Report for Stanmore Coal prepared by Ecological Survey and Management, July 2018
- Guide to determining terrestrial habitat quality: A toolkit for assessing land-based offsets under the Queensland Environmental Offsets Policy, Version 1.2 April 2017
- Guide to determining terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy, Version 1.3 February 2020
- Eyre, T.J., Kelly, A.L, Neldner, V.J., Wilson, B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. (2015). BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2. Queensland Herbarium, Department of Science, Information Technology, Innovation and Arts, Brisbane
- Survey Guidelines for Australia's threatened mammals (Guidelines for detecting Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999)
- SPRAT profiles, referral guidelines, Threatened Species Scientific Committee Conservation and Listing Advice.

3.2.2 Desktop Review

Desktop assessment was conducted to assess the suitability of the offset investigation area as an offset site, to assist in determining target areas for the field surveys and to provide data for the determination of the quality of habitat for MNES within the offset investigation area.

The following resources were reviewed as part of the desktop assessment for the offset investigation area to:

- Wildlife Online Search (20 km buffer of central point co-ordinates -21.52418, 148.75140)
- Existing vegetation mapping released under the provisions of the Vegetation Management Act 1999
- Queensland Herbarium (2019) Regional Ecosystem Description Database (REDD), Version 11.1 (April 2019) (DES, Brisbane)
- Department of Natural Resources, Mines and Energy (DNRME) Vegetation Management Regional Ecosystem and Remnant Map spatial layer (version 10.1)
- Queensland Herbarium BioCondition Benchmarks for Regional Ecosystem Condition Assessment, Department of Environment and Science, Brisbane

3.3 Field Assessment

3.3.1 Timing and Climatic Conditions

An initial field-based assessment was undertaken on June 29 and 30 to determine the suitability of the property to provide potential offsets for habitat for the Koala, Greater Glider and Squatter Pigeon, and to determine if the current DNRME mapping was correct. This assessment focused on the southern portion of the Lot; however, the western section of this area was determined as unsuitable for Squatter Pigeon and the detailed ecological and habitat quality survey focused on the remainder of the Lot to the north. This initial assessment also recorded opportunistic sighting of the MNES.

Further field assessments to determine habitat quality were undertaken over two separate events by two suitably qualified ecologists as follows:

- Survey event 1: Seven (7) days from July 23 and July 29, 2020
- Survey event 1: Four (4) days from October 5 to October 8, 2020

Survey event 1 included field verifying the on-ground vegetation communities, undertaking habitat quality assessments within the field verified communities and targeted fauna surveys for the Koala, Greater Glider and Squatter Pigeon across the total offset investigation area. Survey event 2 was undertaken to specifically target the presence of the Greater Glider and to supplement the habitat quality assessment undertaken in survey event 1.

Weather conditions during and leading up to the July survey period were relatively dry and mild, with maximum day time temperatures reaching mid to high 20's and night-time temperatures between 4 and 13˚C. Total rainfall for the region leading up to the field survey was substantially less than average, except in January, February and May 2020, as shown in Table 2. Weather data was retrieved from the Moranbah Airport Weather Station (034035).

Table 2 Monthly rainfall (mm) recorded at Moranbah Airport prior to and following the July survey

Month	2019					2020						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Average (all years)	7	7.3	24.4	42	56	87.6	100.15	92.4	23.8	30.2	16.7	27.9
Actual Rainfall Total	5.4	0.2	13.4	16.6	9.0	100.2	76.4	53.2	5.2	52.6	11.8	15.4

Source: BOM accessed 24th August 2020 (http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=034035).

Weather conditions during and leading up to the October survey period were dry and warm, with maximum day time temperatures reaching low 30's and night-time temperatures between 14 and 16˚C. Total rainfall for the region leading up to the field survey was substantially less than average, except in January, February and May 2020, as shown in Table 3. Weather data was retrieved from the Moranbah Airport Weather Station (034035).

Table 3 Monthly rainfall (mm) recorded at Moranbah Airport prior to and following the October survey

Month	2019			2020								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Average (all years)	24.4	42.0	56.0	87.6	100.1	92.4	23.8	30.2	16.7	27.9	7	7.3
Actual Rainfall Total	13.4	16.6	9.0	100.2	76.4	53.2	5.2	52.6	11.8	15.4	15.0	16.0

Source: BOM accessed 14th October 2020 (http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=034035).

3.3.2 Determining Habitat Quality Assessment Units

The Department of Natural Resources, Mining and Environment (DNRME) vegetation management regional ecosystem mapping was used to initially determine the likely number and location of habitat assessment plots. These plots were refined following field verification of the mapped vegetation which was undertaken in accordance with the 'Methodology for Survey and Mapping of Regional Ecosystems (RE) and Vegetation Communities in Queensland' (Neldner et. al. 2020). RE classification was determined on the vegetation, soil and landform characteristics identified in the field, geological mapping for the region and the Regional Ecosystem Description Database (REDD).

Regional ecosystem polygons were assigned to remnant or non-remnant status as defined by the Vegetation Management Act 1999 (VM Act). Reference benchmarks for these criteria were obtained from published data (Queensland Herbarium, 2019).

Three (3) assessment units were defined for the offset investigation area following field verification of the on-ground vegetation. During the July survey event, 16 habitat quality plots (HQPs) were assessed across the three (3) assessment units and a further 15 HQPs were assessed during the October survey event (refer Figure 3). The number of HQPs were selected to comply with the Queensland's Department of the Environment and Science (DES) Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy, Version 1.2 (EHP, 2017) (the 'Guide').

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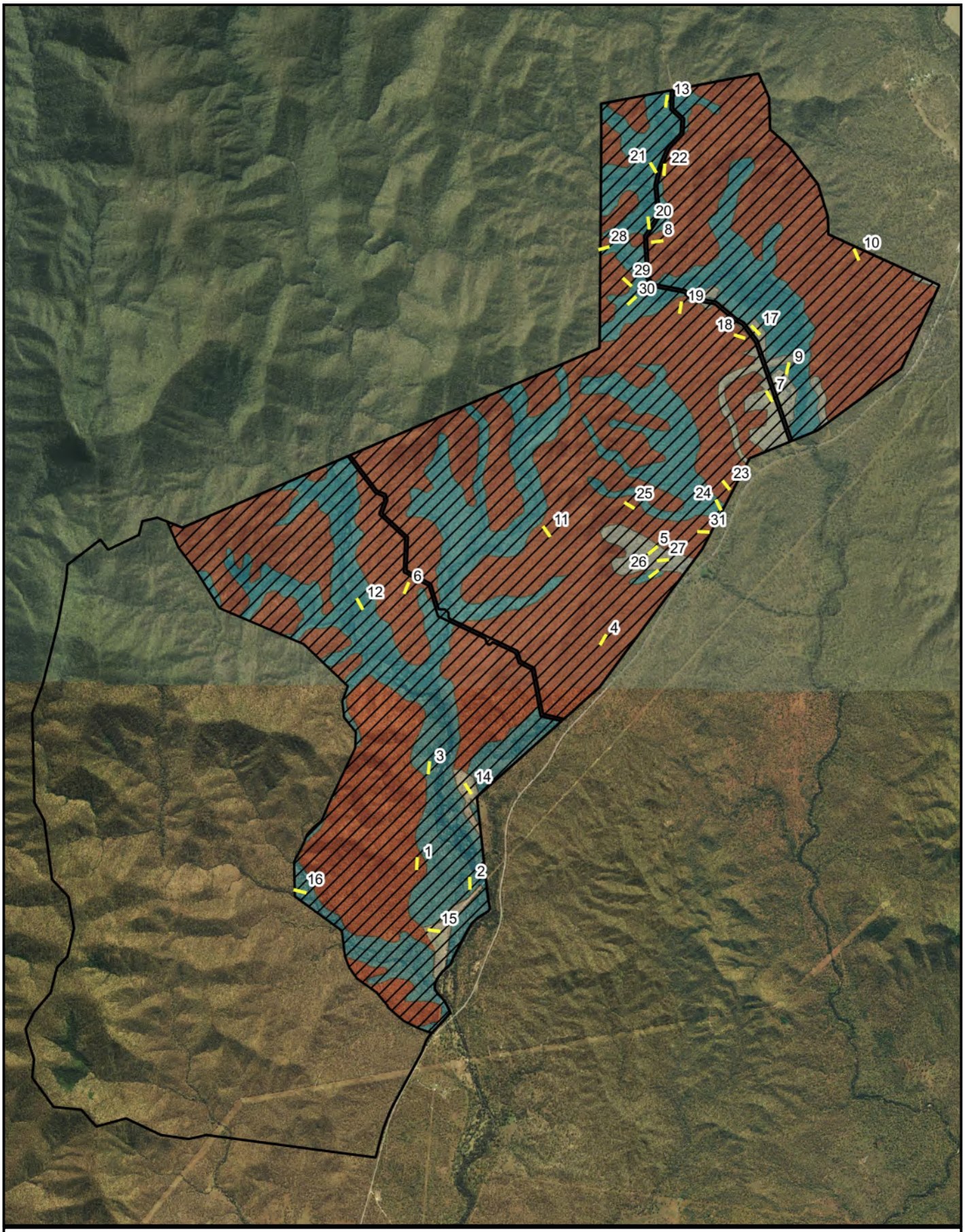

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Date: 19/10/2020
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2020; QSPATIAL 2020; The State of Queensland (Department of Natural Resource and Mines) 2020;

Figure 3: Assessment Units and Habitat Quality Plots

Legend

- Habitat Quality Transect
- Property Boundary
- Offset Investigation Area

Field Verified Regional Ecosystem

- (AU 1) 11.12.1
- (AU 2) 11.3.4
- (AU 3) Non-Remnant

BASE/

3.3.3 Habitat Quality and Scoring

Habitat quality and ecological assessments to assess habitat quality were undertaken within the field verified REs and assessment units as per the requirements of the Guide. The Guide which uses a range of habitat indicators to measure the ecological viability and habitat values of a site and its capacity to support fauna and are separated into three main categories: Site condition, species habitat indices and site context. The first two categories use data collected in the field whereas site context is a geospatial exercise.

Habitat quality within the offset investigation area and the potential of the area to support fauna species including Koala, Squatter Pigeon (southern) and Greater Glider was assessed from 31 habitat quality plots from surveys undertaken in July and October 2020 (Section 3.3.2). Data on the following habitat variables were collected during the field survey:

- Site Condition
- Recruitment of woody perennial species in EDL
- Native plant species richness - trees
- Native plant species richness - shrubs
- Native plant species richness - grasses
- Native plant species richness - forbs
- Tree canopy height
- Tree canopy cover
- Shrub canopy cover
- Native perennial grass cover
- Organic litter
- Large trees
- Coarse woody debris
- Non-native plant cover
- Quality and availability of food and foraging habitat
- Quality and availability of shelter
- Threat to Species
- Species mobility capacity

3.3.4 Photo monitoring points

Photographs were taken within each assessment plot for the purposes of providing baseline imagery for ongoing monitoring. Photographs were taken along the Biocondition transect centreline at the ends of each plot (e.g. at 0 m and 100 m), and in the order: north (0°), east (90°), south (180°) and west (270°) at the centre of the plot (e.g. at 50 m mark) Photos of the groundcover intersected by the centreline tape and soils were also taken at some HQPs 50 m along the plot. These photos are provided in Appendix C.

3.3.5 Targeted Fauna Surveys and Spotlighting

Diurnal bird surveys, diurnal koala searches nocturnal spotlighting surveys were undertaken on the nights of the 23rd and 27th July 2020, and again between October 5 and 8, 2020. Surveys were undertaken in accordance with the relevant survey guidelines and modified were required based ecological experience in maximizing the detection of the Koala, Greater Glider and Squatter Pigeon. Diurnal searches for Koala's and Squatter Pigeon were undertaken during the habitat quality assessment and whilst traversing between the HQP. For spotlighting, a minimum of two person hours was spent per night, using a combination of high-powered spotlights and head torches. Visual surveys were undertaken in target habitat, searching trees, shrubs and understory habitats for the Koala and Greater Glider.

To maximise the likelihood of detecting the Koala and Greater Glider the search effort was targeted within remnant vegetation supporting koala food trees and trees bearing hollow's large enough for the Greater Glider. Target areas included areas of remnant RE 11.3.4 on floodplains and fringing major watercourses. All opportunistic records were also recorded as were signs of the Koala including tree scratches and scats.

3.3.6 Weed and pest surveys

Active and opportunistic searches were used to identify weed and pest species presence. Weed species were recorded within HQPs and opportunistically while traversing the offset investigation area. Pest species were also opportunistically surveyed throughout the offset investigation area during the day and at night while undertaking nocturnal surveys and spotlighting (refer section 3.3.5).

4.0 Results

The initial field based resulted in the exclusion of the southern and south-western portion of Lot 4 as suitable habitat for the Squatter Pigeon. The Koala and Squatter Pigeon (southern) were positively identified within the south-eastern and middle sections of the Lot and suitable habitat for Greater Glider in the form of large tree hollows were also identified along the riparian areas. The initial survey also determined the current DNRME mapping was also likely to be incorrect based on the clear distinctions between the riparian zones and the adjacent woodlands. However, a remapping exercise was not undertaken but deferred to the detailed ecological and habitat quality survey.

4.1 Vegetation mapping

Desktop assessment of the current DNRME Regional Ecosystem mapping identified four (4) REs within the offset investigation area with small, isolated sections of non-remnant also present. The riparian areas were represented by mixed polygons of 11.12.1 and 11.3.4 (Table 4).

Field verification of the offset investigation area identified two (2) REs (11.3.4 and 11.12.1) as being present and confirmed the non-remnant areas as correct. The field verification could also separate the mixed 1.12.1/11.3.4 polygons based on the clear separation of the underlying landzone. The preliminary field verified RE mapping was later refined using aerial photography and contour data. Figure 3 shows the field verified RE mapping over the offset investigation area.

The two (2) field verified REs along with the non-remnant area were used as the assessment units for the purposes of calculating the number of habitat quality plots required.

Table 4 Regional ecosystems within the offset investigation area

RE	Short Description	VM Act Status
11.12.1/11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains	Of concern
11.12.1a	*Eucalyptus crebra* woodland on igneous rocks	Least concern
11.12.6a	*Corymbia citriodora* open forest on igneous rocks (granite)	Least concern
8.12.7	*Corymbia citriodora* +/- *Eucalyptus portuensis* +/- *E. drepanophylla* (or *E. crebra*) open forest on hill slopes and undulating plateaus, on Mesozoic to Proterozoic igneous	Least concern
Non-remnant	-	None

Based on the size of the assessment units and the requirements of The Guide, 31 HQPs were assessed across the three (3) assessment units (Table 5 and Figure 3).

Table 5 Habitat quality plots and corresponding RE

Assessment Unit	RE	Number HQPs
AU1	11.12.1	13
AU2	11.3.4	12
AU3	Non-remnant	6
Total		**31**

4.2 Habitat Quality Scoring

The field data recorded at each of the HQPs for each assessment unit was used in combination with geospatial information to determine a habitat quality score for habitat in the offset investigation area. Data collected from each of the 31 HQPs was compared with the BioCondition benchmarks for the corresponding REs and converted to a score out of 10 using the Department of Agriculture, Water and the Environment (DAWE) Modified Habitat Quality Spreadsheet.

The offset area habitat quality scores for each of the three species for the whole of the offset investigation area before any sub-division of the area into specific project boundaries is:

- Koala – 5/10 (rounded up from 4.8);
- Greater Glider – 5/10 (rounded from 5.2); and
- Squatter Pigeon – 5/10 (rounded from 5.2).

4.3 Targeted Fauna Surveys and Spotlighting

4.3.1 Desktop results

Based on the SPRAT habitat description and the habitat definition included in the IPEE Public Environmental Review (PER) Guideline, any forest or woodlands, including remnant, regrowth and modified communities that contain Koala food trees or shrublands with emergent food trees are all potential Koala habitat. Desktop assessment identified Koalas have been previously found immediately adjacent to the investigation area and along the Peak Downs Highway (Figure 4). The presence of Koalas within the offset investigation areas is also supported by anecdotal evidence from the landowner who has indicated that Koalas have previously been seen within the investigation area and throughout the wider Mt Spencer Station (A. Key *pers comm*. and D. Wright *pers comm*.).

The approved conservation advice for the Greater Glider (TSSC, 2016) along with habitat definitions included in the PER Guidelines, indicate that Greater Glider habitat overlaps Koala habitat. As such, Eucalypt Forests and Woodlands that contain hollow bearing trees, particularly in riparian areas, are all potential Greater Glider habitat. Desktop assessment including the Atlas of Living Australia database, showed the multiple Greater Glider records approximately 8km to the west of the offset investigation in similar habitat within the large and unfragmented Epsom State Forest and the adjacent which directly connects to the offset area (see Figure 4). Greater Gliders have also been recorded along the Peak Downs Highway in the vicinity of Mt Spencer during the DTMR Koala Research Project (Melzer et al. 2018).

Squatter Pigeon records within the vicinity of the offsets investigation area are limited with the nearest occurring approximately 8km to the west and south-west (Figure 4). Anecdotal evidence from the landowner has indicated that Squatter Pigeons have previously been seen within the investigation area and throughout the wider Mt Spencer Station (D. Wright *pers comm*.). Based on the PER habitat definition, the preliminary desktop assessment of the investigation area using current DNRME mapping suggests the majority of the broader offset investigation area has the potential to provide breeding and foraging habitat For the Squatter Pigeon.

4.3.2 Field results

The presence of the Koala was confirmed during the initial site visit in late June and the subsequent detailed ecological and habitat quality surveys in July and October. One Koala was sighted during the June site visit, three Koala's were sighted during the detailed survey in July and nine (9) Koala's were sighted in the October survey. These sightings occurred in the south-eastern, middle and north-eastern section of the investigation area. Evidence in the form of tree scratches and scats were also observed during all surveys throughout the offset investigation area (Figure 5, Plate 1). Further, numerous instances of Koala road kills have been recorded along the Peak Downs Highway adjacent to the offset investigation area and several road kills were observed during the July survey period. As the Koala sightings over the three field

assessment are likely to be repeat sightings of some of the same individuals, an estimate of the actual numbers of individual Koalas is not possible at this stage.

During the initial survey in June and the detailed July the Greater Glider was not confirmed present, although surveys recorded numerous instances of large tree hollows along the riparian zones of RE 11.3.4 and desktop. The presence of the Greater Glider was confirmed during the October survey which was undertaken to specifically target the species, and occurred in the southern/middle section of the offset investigation area (Figure 5; Plate 2). An additional sighting of a Glider sp. with similar morphology to the Greater Glider, was observed along the Cut Creek riparian corridor in the northeastern section of the offset investigation area the and within habitat RE 11.3.4 that is known to support the Greater Glider.

Squatter Pigeons (southern) were also observed throughout the investigation area during the June and July survey periods. Squatter Pigeons were observed at five (5) separate locations during the June survey and was confined to the south-eastern section of the investigation area and in a arrange of differing habitat types including remnant and non-remnant vegetation with varying extents of ground cover (Figure 5; Plate 3). Six (6) instances of Squatter Pigeons (southern) were recorded during the detailed survey in July and occurred in the southern, middle and north-east section of the offset investigation area. Squatter pigeons were not observed in the October surveys.

The following additional species were identified during spotlighting surveys:

- Yellow-bellied Glider (*Petaurus australis*)
- Rufous Bettong (*Aepyprymnus rufescens*)
- Brushtail Possums (*Trichosurus vulpecula*)
- Stony-creek Frog (call) (*Litoria wilcoxi*)

Plate 1 Koala scat (left) and individual koala observed in a Eucalyptus crebra tree (right) during the July 2020 field surveys

Plate 2 Greater Glider observed in Corymbia erythrophloia during the October 2020 surveys

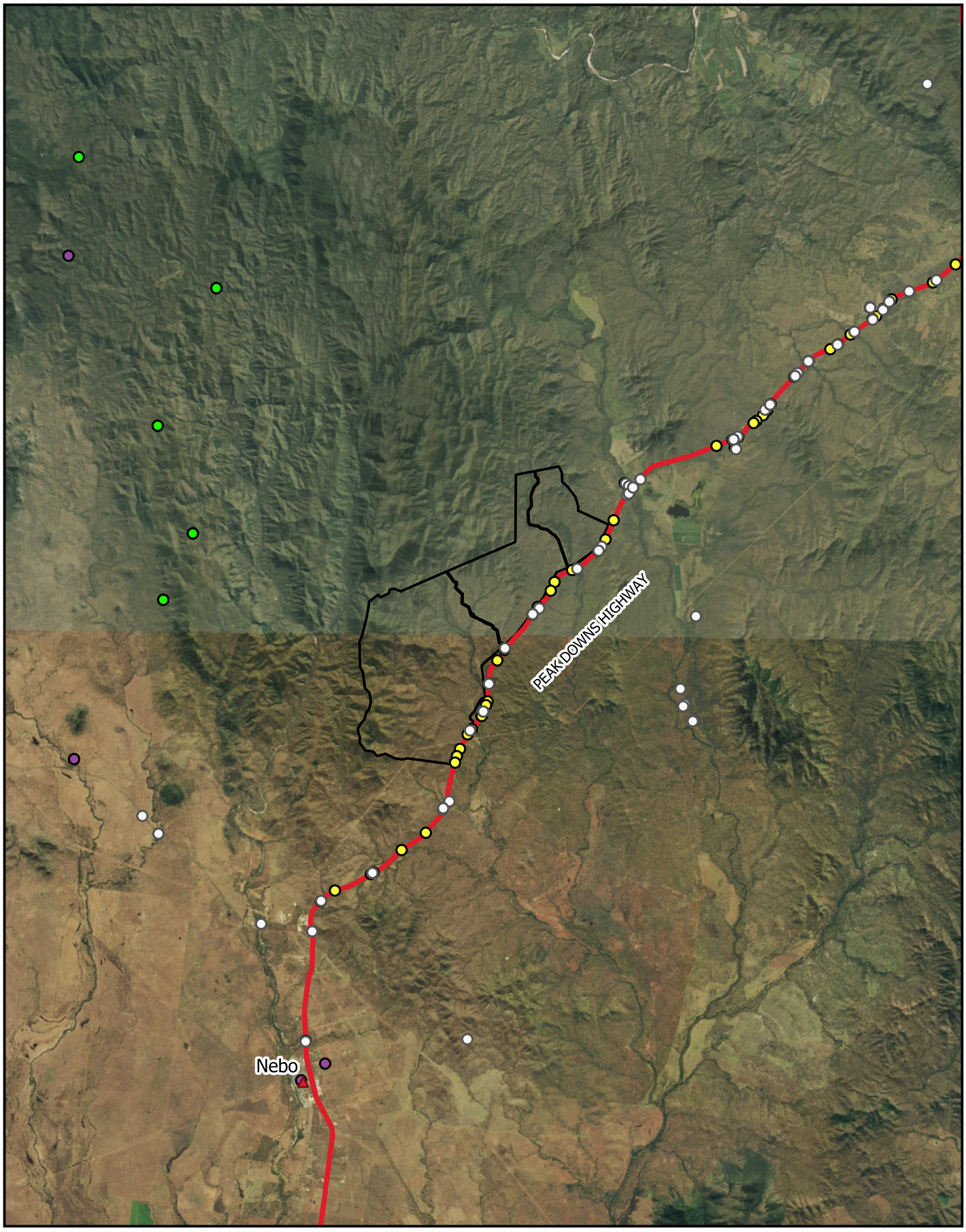
Plate 3 Squatter Pigeon observed during the June 2020 field surveys

4.4 Weeds and pests

A total of 34 weed species were recorded within the offset investigation area, of which five (5) are 'restricted matters' under the Queensland Biosecurity Act 2014. Of these five (5) species, four (4) are Weeds of National Significance (WoNS). *Lantana camara* was observed throughout the majority of the HQPs and was most abundant within RE 11.3.4 especially along the banks of watercourses. Johnston grass (*Sorghum halepense*) was observed throughout a select few HQPs, high abundance was recorded when observed indicating seeding for fodder.

Introduced fauna species were identified either directly or via their traces (e.g. scats, tracks, diggings). A total of eight (8) introduced fauna species were identified, including six (6) that are 'Restricted Matters' under the Queensland *Biosecurity Act 2014*.

The full list of weeds and pests is provided in Appendix B.



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Scale @ A3: 1 : 200000
Date: 21/10/2020
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2020; QSPATIAL 2020; The State of Queensland (Department of Natural Resource and Mines) 2020;

Figure 4: Historical Fauna Records Within 20 Km of Lot 4SP277438

Legend

- Towns
- **ALA & Wildnet Records**
- Greater Glider
- Koala ALA
- Squatter Pigeon
- DTMR: Koala Records
- Highways
- Lot 4SP277438 Boundary
- Offset Investigation Area

BASE/

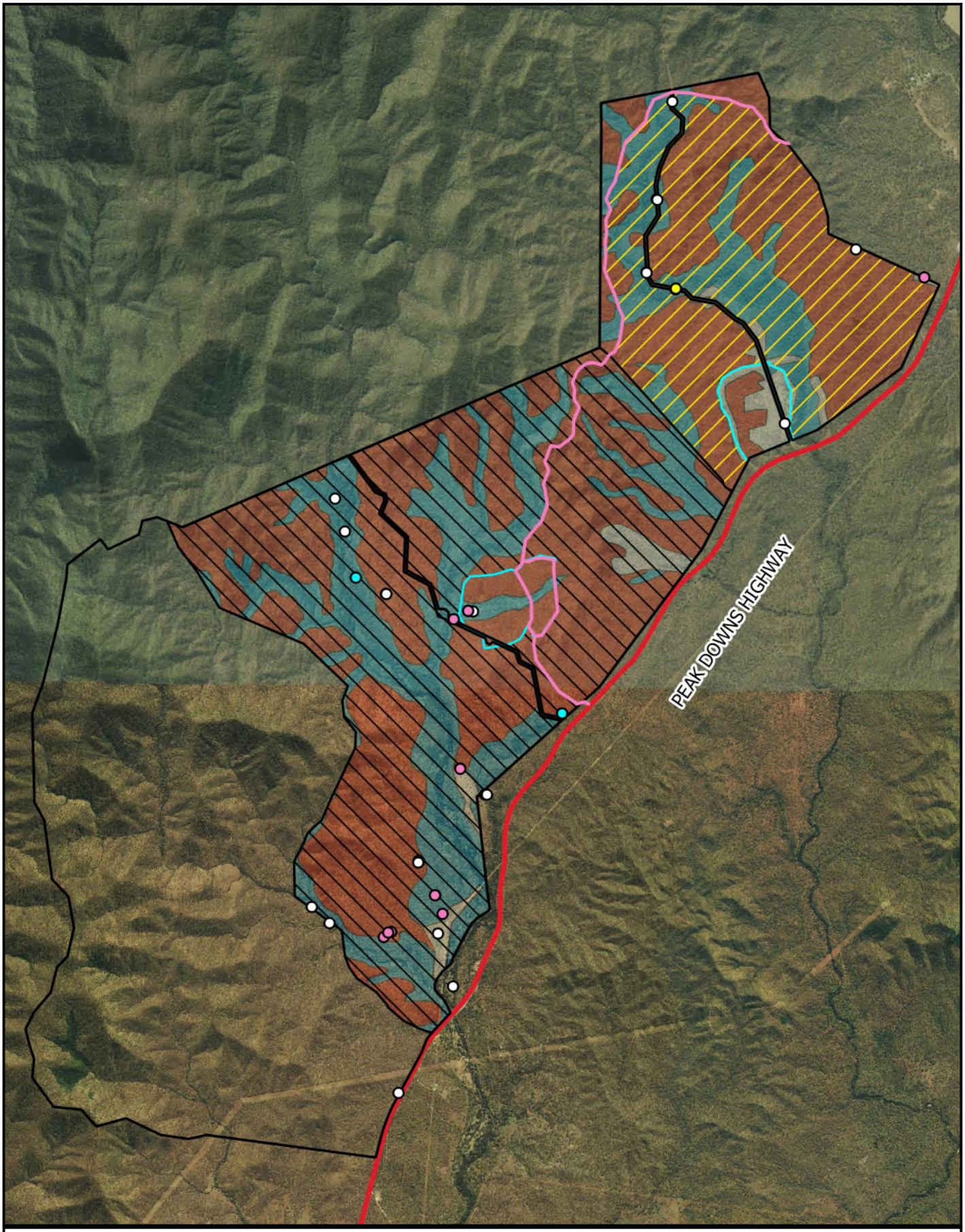

Figure 5: Species Occurrence Within Lot 4SP277438

0 1 km

Scale @ A3: 1 : 55000
Date: 21/10/2020
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2020; QSPATIAL 2020; The State of Queensland (Department of Natural Resource and Mines) 2020;

Legend

- Koala/Koala Scats
- Greater Glider
- Greater Glider (Unconfirmed)
- Squatter Pigeon
- Lot 4SP277438 Boundary
- IPEE Offset Area
- Offset Investigation Area
- Holding Yards

Field Verified RE Mapping

- 11.12.1
- 11.3.4
- Non-Remnant

BASE/

5.0 Conclusion

In order to assess the suitability of Lot 4 within Mt Spencer Station to provide suitable offsets for impact to Koala, Greater Glider and Squatter Pigeon from impacts associated with the development of the IPE, IPEE and ID projects, a combined desktop and field-assessment was undertaken to determine the habitat quality of the Mount Spencer Station offset investigation area and to determine the presence of the three MNES within the offset investigation area.

Remnant vegetation was present across most of the offset investigation area and was assessed as providing suitable habitat for the three (3) target species. Additionally, all three (3) target species were confirmed present during the three (3) survey events.

Assessment Units located within suitable habitat areas in which habitat quality assessments were undertaken, and a habitat quality score calculated.

The offset area habitat quality scores for each of the three species for the whole of the offset investigation area before any sub-division of the area into specific project boundaries is:

- Koala – 5/10 (rounded up from 4.8);
- Greater Glider – 5/10 (rounded from 5.2); and
- Squatter Pigeon – 5/10 (rounded from 5.2).

Given the moderate quality of the habitat and the confirmed presence of the three (3) target species within the offset investigation area, the proposed offset area is considered suitable to offset the residual impacts of the IPE, IPEE and ID projects on the Koala, Greater Glider and Squatter Pigeon.

6.0 References

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Threatened Species Scientific Committee (TSSC), 2016. Approved Conservation Advice for the Greater Glider (Petauroides Volans). Department of the Environment, Australian Government, Canberra.

Appendix A Targeted Fauna Species Records

Attribute	Count	Date	Latitude	Longitude
Koala Scat	-	28/07/2020	-21.5557	148.7529
Squatter Pigeon	1	28/07/2020	-21.4918	148.8023
Squatter Pigeon	1	28/07/2020	-21.5519	148.7526
Squatter Pigeon	1	23/07/2020	-21.5556	148.7478
Koala in *Casuarina cristata*	1	28/07/2020	-21.5422	148.7578
Koala Scat	-	23/07/2020	-21.5532	148.7399
Koala	1	26/07/2020	-21.4891	148.7952
Squatter Pigeon	1	27/07/2020	-21.5253	148.7542
Squatter Pigeons	2	29/06/2020	-21.5555	148.7481
Squatter Pigeons	10	29/06/2020	-21.556	148.7473
Koala scats	-	29/06/2020	-21.5548	148.7417
Koala scats	-	29/06/2020	-21.5607	148.7545
Koala scats	-	29/06/2020	-21.5229	148.747
Squatter Pigeon	1	29/06/2020	-21.5397	148.755
Squatter Pigeons	7	29/06/2020	-21.5397	148.755
Squatter Pigeons	5	29/06/2020	-21.5537	148.7534
Dead Koala	1	25/07/2020	-21.6197	148.7096
Koala in *Casuarina cunninghamiana*	1	28/07/2020	-21.5422	148.7576
Koala scats	-	30/06/2020	-21.5711	148.749
Squatter Pigeons	5	30/06/2020	-21.5244	148.7557
Fresh Koala Scat	-	30/06/2020	-21.5245	148.7562
Dead Koala	1	25/07/2020	-21.6197	148.7097

Koala	1	29/06/2020	-21.5229	148.7472
Koala	1	28/07/2020	-21.5486	148.7508
Dead Koala	1	28/07/2020	-21.6162	148.716
Koala	1	29/06/2020	-21.5229	148.7472
Squatter Pigeons	3	30/06/2020	-21.5245	148.7557
Squatter Pigeon	1	28/07/2020	-21.552	148.7526
Koala	1	28/07/2020	-21.5488	148.7508
Koala	1	28/07/2020	-21.5487	148.7509
Greater Glider	1	6/10/2020	-21.5343	148.7655
Greater Glider	1	6/10/2020	-21.5214	148.744
Koala	2	5/10/2020	-21.4751	148.7761
Koala	1	6/10/2020	-21.5169	148.7428
Koala	1	5/10/2020	-21.4845	148.7746
Koala	1	5/10/2020	-21.4846	148.7747
Greater Glider (unconfirmed)	1	5/10/2020	-21.4931	148.7767
Koala	1	5/10/2020	-21.506	148.7881
Koala	1	5/10/2020	-21.4932	148.7767
Koala	1	5/10/2020	-21.4916	148.7737
Koala	1	5/10/2020	-21.4916	148.7737
Koala	1	6/10/2020	-21.5138	148.7418

Appendix B Weed and Pest Species List

Scientific name	Common Name	Status	
		WoNS	Biosecurity Act 2014 Restricted Matter Category
Weeds			
Ageratum houstonianum	Blue-billy goat weed	-	-
Alysicarpus ovalifolius	Oval-leafed Alysicarpus	-	-
Asclepias curassavica	red-head cotton bush	-	-
Bidens pilosa	Cobbler's pegs	-	-
Bothriochloa pertusa	Indian couch	-	-
Cenchrus ciliaris	Buffel grass	-	-
Cirsium vulgare	Spear thistle	-	-
Cryptostegia grandiflora	Rubber vine	Yes	Category 3
Cyclospermum leptophyllum	Wild celery	-	-
Cyperus esculantus	Yellow nutsedge	-	-
Emilia sonchifolia	Sow thistle	-	-
Gomphocarpus physocarpus	Ballon cotton bush	-	-
Justicia betonica	Paper plume	-	-
Lantana camara	Lantana	Yes	Category 3
Lepidium africanum	African pepperwort	-	-
Malvastrum americanum	Spiked malvastrum	-	-
Megathyrsus maximus	Green panic	-	-
Melenis repens	Red natal	-	-
Opuntia tomentosa	Velvety tree pear	Yes	Category 3
Oxalis corniculata	Creeping woodsorrel	-	-
Parthenium hysterophorus	Parthenium	Yes	Category 3
Passiflora suberosa	Corky passionflower	-	-
Portulaca pilosa	Hairy portulaca	-	-
Praxelis clematidea	Praxelis	-	-
Richardia brasiliensis	White eye	-	-
Richardia stellaris	Field madder	-	-
Senna obtusifolia	Sicklepods	-	Category 3
Senna occidentalis	Coffee senna	-	-

Scientific name	Common Name	Status	
		WoNS	Biosecurity Act 2014 Restricted Matter Category
Sida cordifolia	Flannel weed	-	-
Sida rhombifolia	Paddy's lucerne	-	-
Sorghum halepense	Johnstone grass	-	-
Sonchus oleraceus	Common sowthistle	-	-
Stylosanthes scabra	Shrubby stylo	-	-
Themeda quadrivalvis	Grader grass	-	-
Urochloa decumbens	Sabi grass	-	-
Pests			
Oryctolagus cuniculus	Rabbit		Categories 3,4,5,6
Sus scrofa	Feral pig		Categories 3,4,6
Canis lupus familiaris	Wild dog		Categories 3,4,6
Canis lupus dingo	Dingo		Categories 3,4,5,6
Vulpes vulpes	European Fox		Categories 3,4,5,6
Equus caballus	Feral horse		N/A
Bufo marinus	Cane toad		N/A
Felis catus	Feral cat		Categories 3,4,6

Appendix C Habitat Quality Plot photos

Habitat Quality Plot 1		
		
Start of transect (0m) - North-North east	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 2		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 3		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 4		
		**PHOTO NOT AVAILABLE**
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 5		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 6		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 7		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 8		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 9		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 10		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

Habitat Quality Plot 11		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
	**PHOTO NOT AVAILABLE**	
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

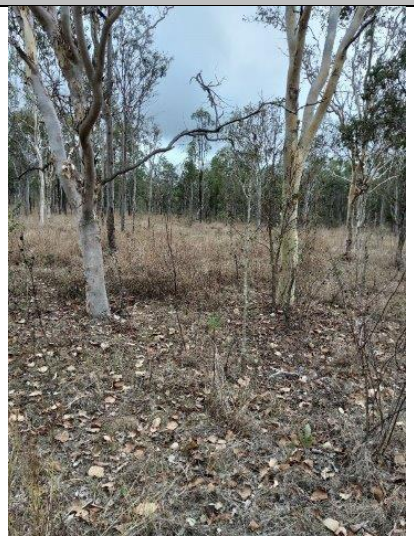
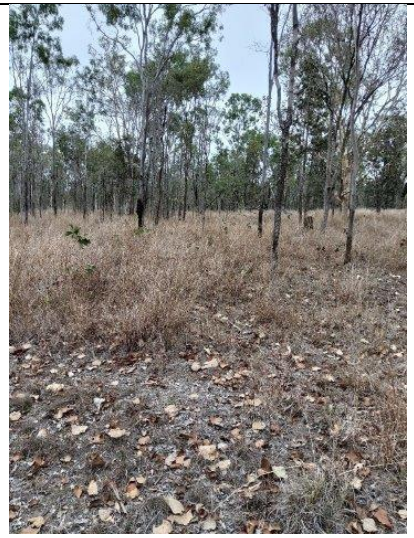
Habitat Quality Plot 12		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

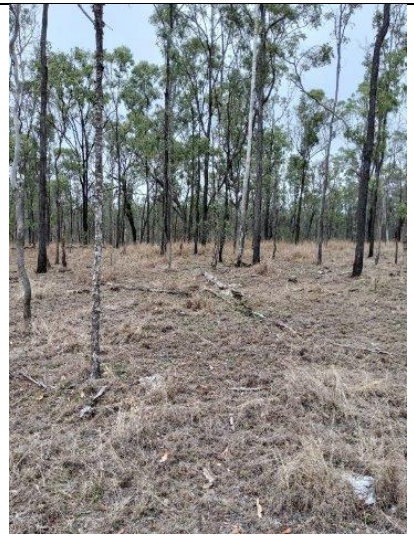
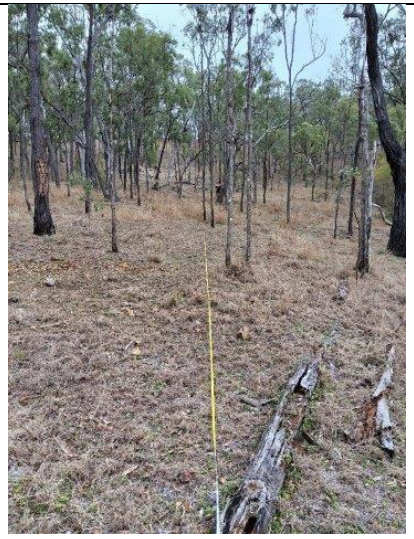
Habitat Quality Plot 13		
		
Start of transect (0m) - North	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m) - South

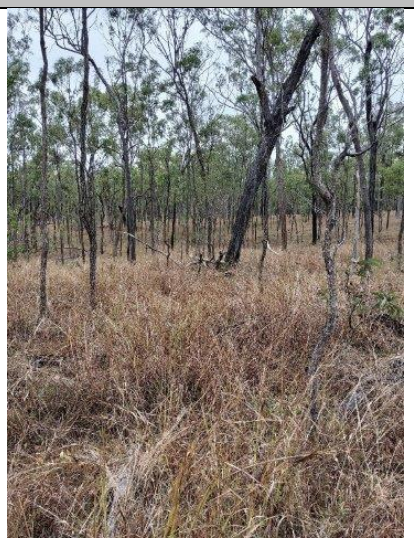
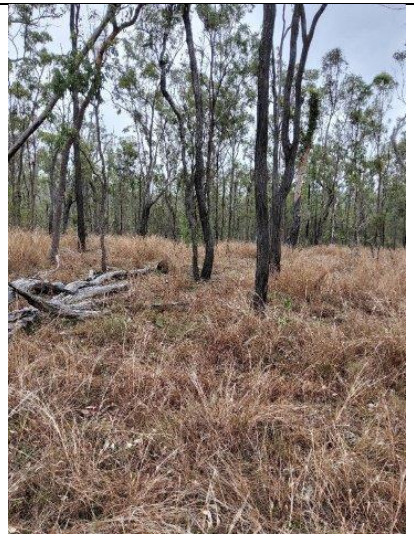
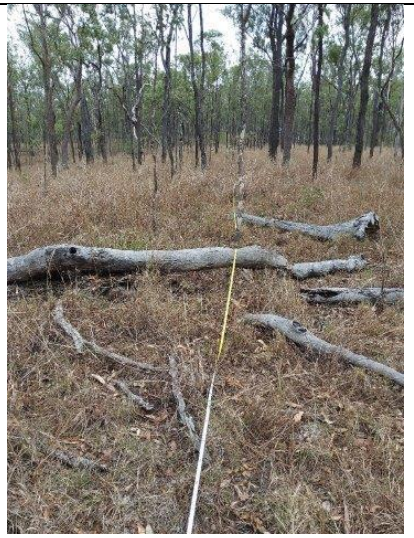
Habitat Quality Plot 14		
PHOTO NOT AVAILABLE Start of transect (0m)	 Centre point (50m) - North	 Centre point (50m) - East
 Centre point (50m) - South	 Centre point (50m) - West	**PHOTO NOT AVAILABLE** End of transect (100m)

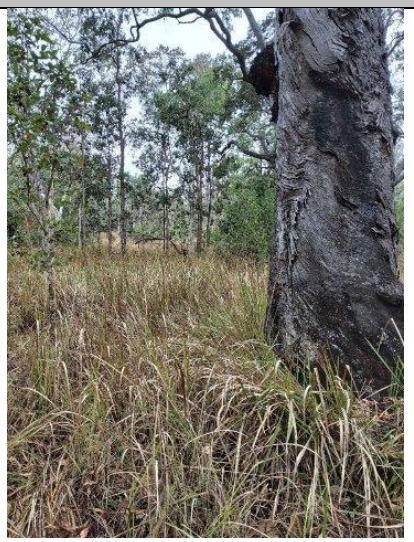
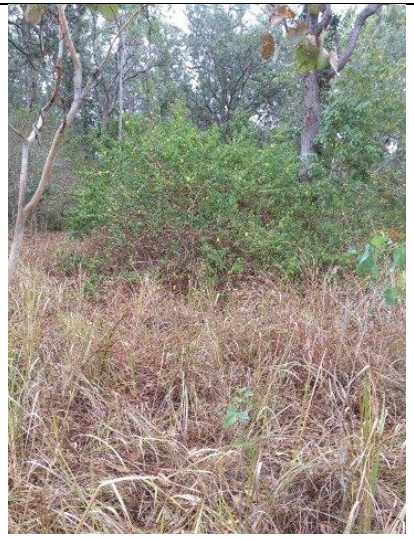
Habitat Quality Plot 15		
 Start of transect (0m) - East	**PHOTO NOT AVAILABLE** Centre point (50m) - North	 Centre point (50m) - East
 Centre point (50m) - South	**PHOTO NOT AVAILABLE** Centre point (50m) - West	 End of transect (100m) - South

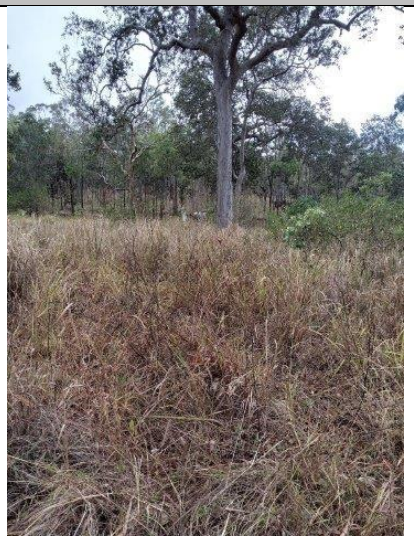
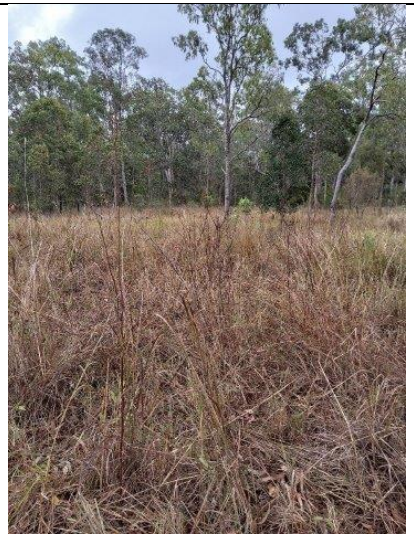
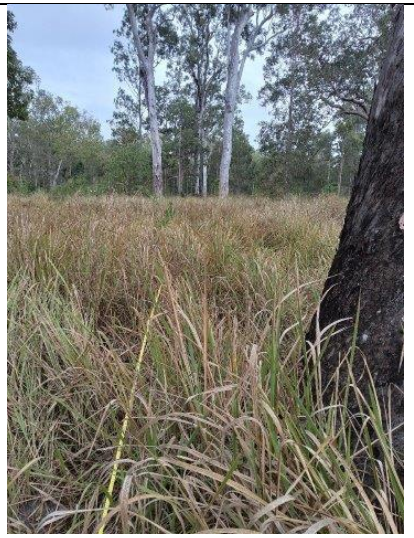
Habitat Quality Plot 16		
 Start of transect (0m) - North	**PHOTO NOT AVAILABLE** Centre point (50m) - North	 Centre point (50m) - East
 Centre point (50m) - South	 Centre point (50m) - West	 End of transect (100m) - South

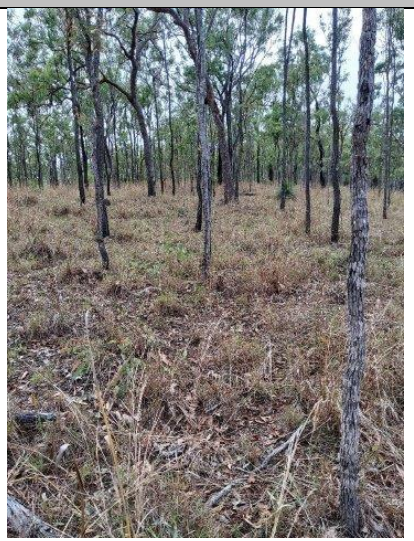
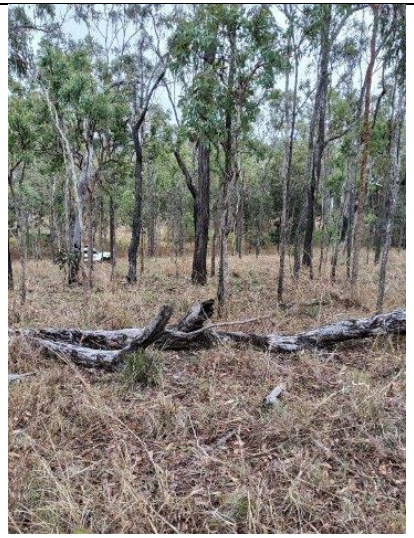
Habitat Quality Plot 17		
 Start of transect (0m)	 Centre point (50m) - North	 Centre point (50m) - East
 Centre point (50m) - South	 Centre point (50m) - West	**Photo not available** End of transect (100m)

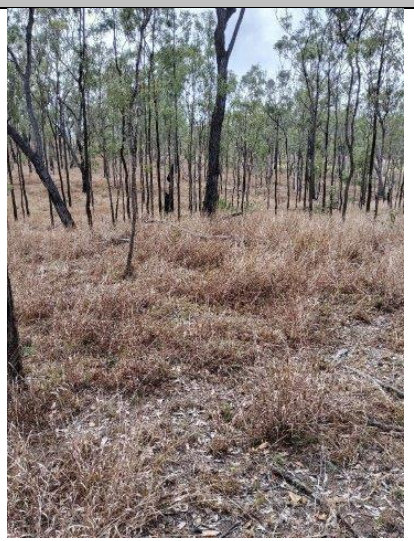
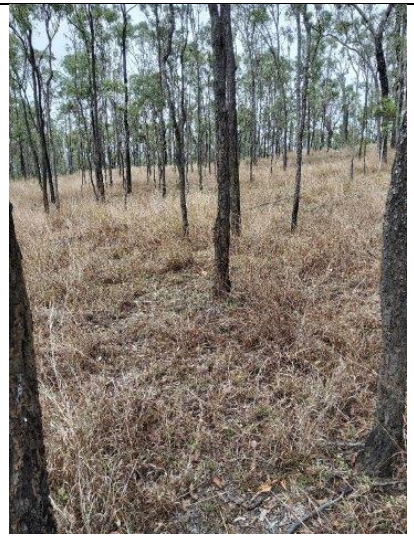
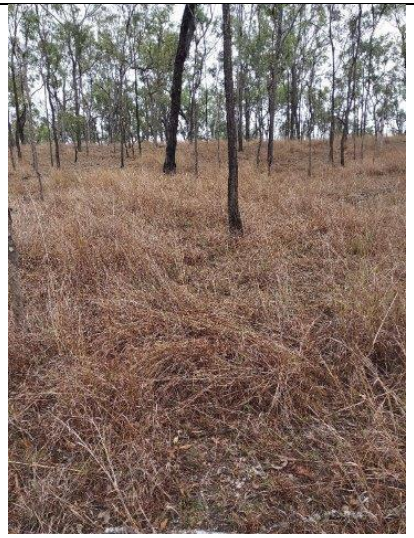
Habitat Quality Plot 18		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

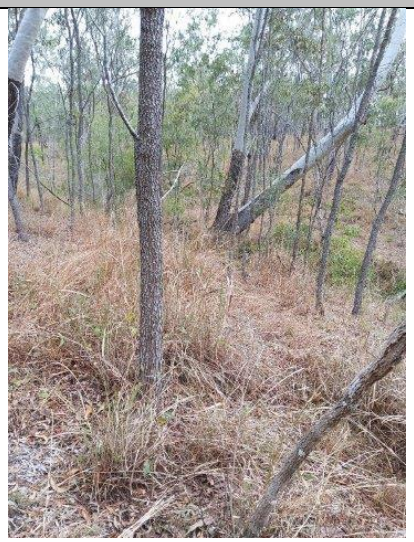
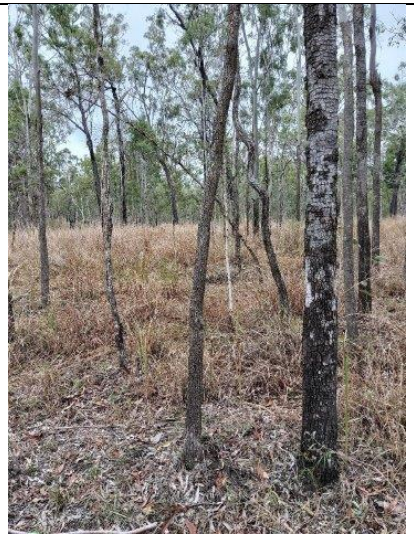
Habitat Quality Plot 19		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

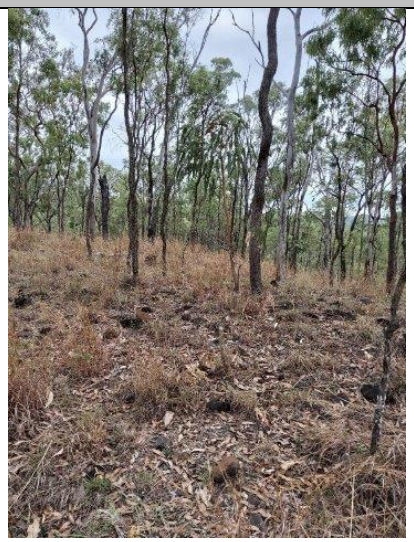
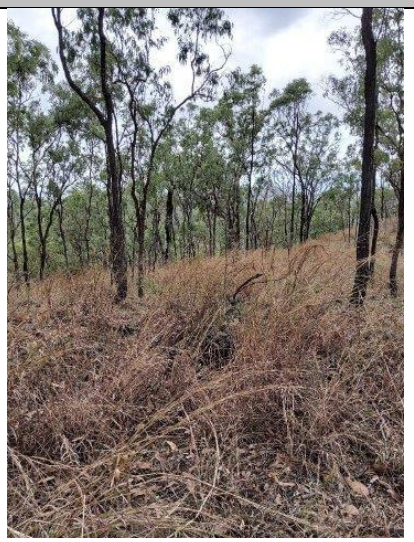
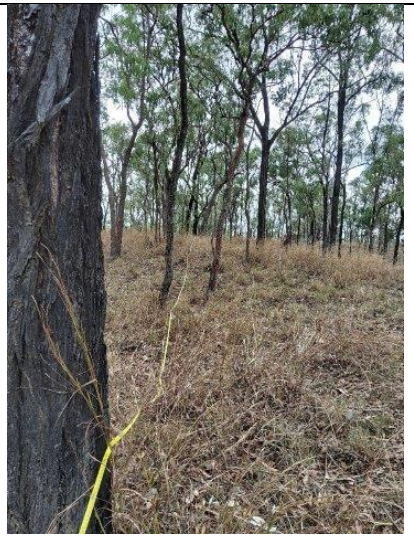
Habitat Quality Plot 20		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

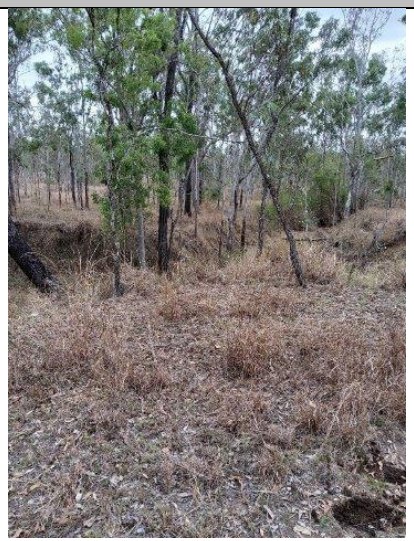
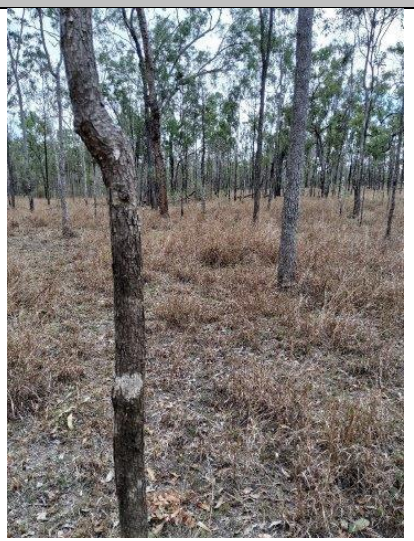
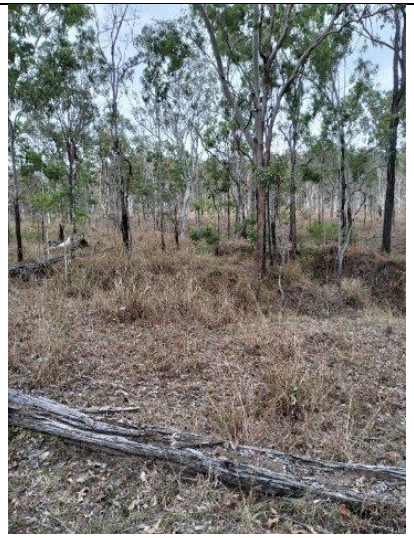
Habitat Quality Plot 21		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

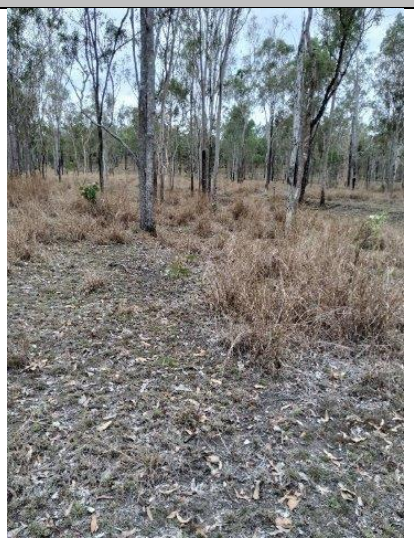
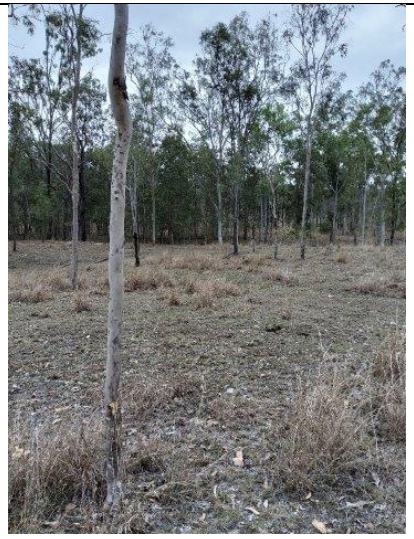
Habitat Quality Plot 22		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

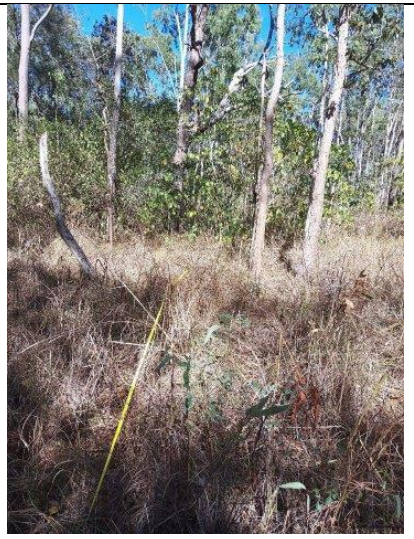
Habitat Quality Plot 23		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

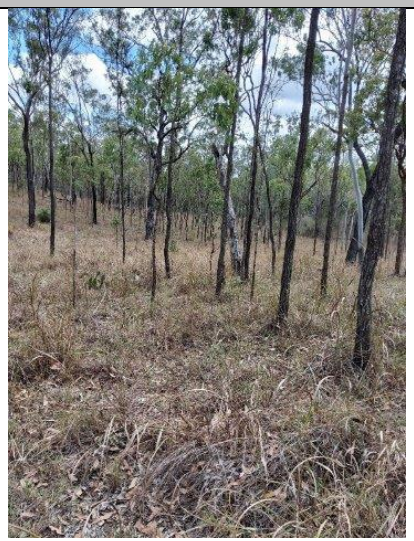
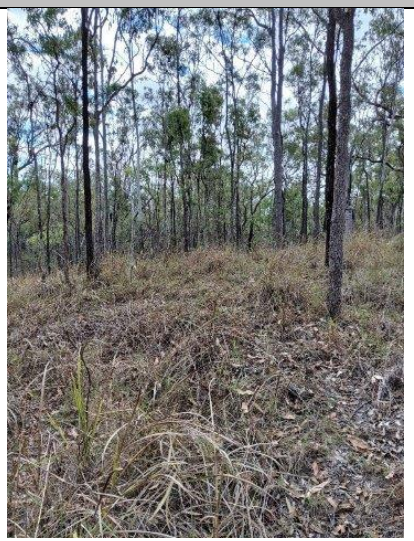
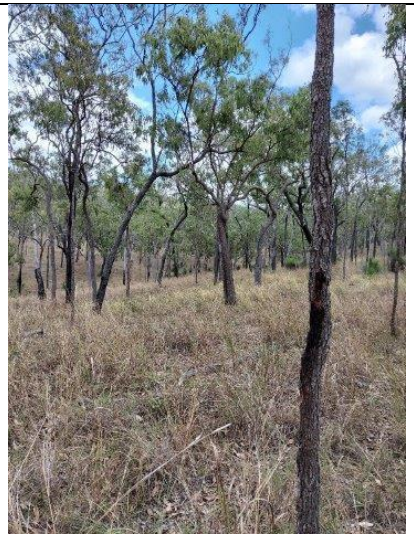
Habitat Quality Plot 24		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

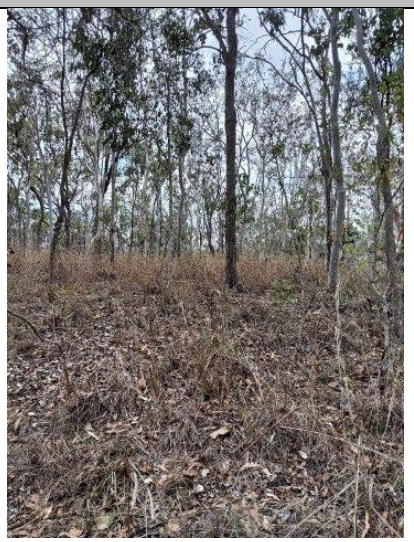
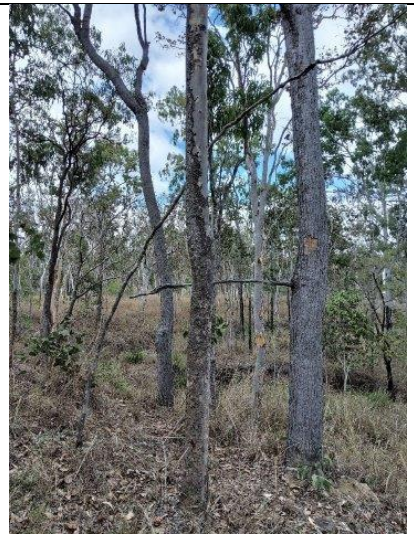
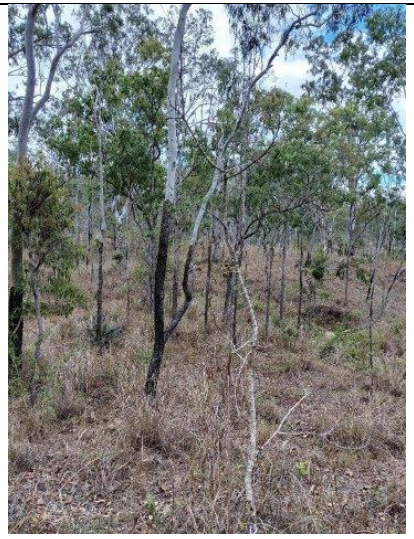
Habitat Quality Plot 25		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

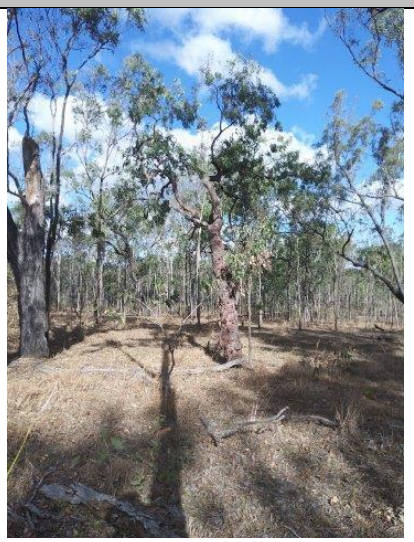
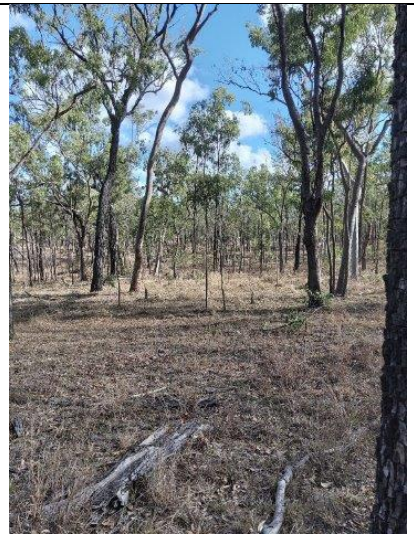
Habitat Quality Plot 26		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

Habitat Quality Plot 27		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

Habitat Quality Plot 28		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

Habitat Quality Plot 29		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

Habitat Quality Plot 30		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

Habitat Quality Plot 31		
		
Start of transect (0m)	Centre point (50m) - North	Centre point (50m) - East
		
Centre point (50m) - South	Centre point (50m) - West	End of transect (100m)

Appendix D

Offset Site Habitat Quality Scores

OFFSET AREA - Koala

Assessment Unit - Regional Ecosystem	AU 1 - RE 11.12.1 remnant												AU 2 - RE 11.3.4 remnant										AU 3 - RE 11.3.4 non-remnant								Total	Total
Site Reference	Benchmark	MSB23			MSB25			MSB31			Average %		Benchmark	MSB24			MSB26			Average %			Benchmark	MSB5			MSB27			Average %			
	11.12.1	Raw Data	% Benchmark	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	benchmar	Average Score	11.3.4	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	benchmar	Average Score		11.3.4	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	benchmar	Average Score		
Site Condition																																	
Recruitment of woody perennial species in EDL	**100**	100	100.00	5	100	100.00	5	80	80.00	5	93%	5.0	100	100	100.00	5	100	100.00	5	100%	5.0		100	60	60.00	3	80	80.00	5	70%	4.0	89%	4.71
Native plant species richness - trees	**3**	4	133.33	5	4	133.33	5	5	166.67	5	144%	5.0	4	6	200.00	5	7	233.33	5	217%	5.0		4	5	166.67	5	5	166.67	5	167%	5.0	171%	5.00
Native plant species richness - shrubs	**6**	2	33.33	3	2	33.33	3	1	16.67	2.5	28%	2.8	2	4	66.67	3	2	33.33	3	50%	3.0		2	0	0.00	2.5	1	16.67	2.5	8%	2.5	29%	2.79
Native plant species richness - grasses	**8**	4	50.00	3	4	50.00	3	2	25.00	3	42%	3.0	7	7	87.50	3	6	75.00	3	81%	3.0		7	4	50.00	3	5	62.50	3	56%	3.0	57%	3.00
Native plant species richness - forbes	**13**	6	46.15	3	12	92.31	5	4	30.77	3	56%	3.7	10	6	46.15	3	7	53.85	3	50%	3.0		10	7	53.85	3	5	38.46	3	46%	3.0	52%	3.29
Tree canopy height (average of emergent, canopy, sub-canopy)	**12.5**	15	120.00	5	12	96.00	5	12.5	100.00	5	105%	5.0	17	16.2	129.60	5	14.8	118.40	5	124%	5.0		17	12.35	98.80	5	12	96.00	5	97%	5.0	108%	5.00
Tree canopy cover (average of emergent, canopy, sub-canopy)	**21**	13.75	65.48	5	28.45	135.48	5	24.65	117.38	5	106%	5.0	11	25	119.05	5	17.55	83.57	5	101%	5.0		11	17.7	84.29	5	10.7	50.95	5	68%	5.0	94%	5.00
Shrub canopy cover	**4**	0	0.00	0	0.9	22.50	3	0.3	7.50	0	10%	1.0	1	0.9	22.50	3	1	25.00	3	24%	3.0		1	0	0.00	0	0	0.00	0	0%	0.0	11%	1.29
Native grass cover	**41**	52	126.83	5	50	121.95	5	40	97.56	5	115%	5.0	43	45	109.76	5	48	117.07	5	113%	5.0		43	33	80.49	3	54	131.71	5	106%	4.0	112%	4.71
Organic litter	**28**	30	107.14	5	33	117.86	5	35	125.00	5	117%	5.0	20	47	167.86	5	27	96.43	5	132%	5.0		20	36.2	129.29	5	25	89.29	3	109%	4.0	119%	4.71
Large trees (euc plus non-euc)	**20**	10	50.00	10	4	20.00	5	10	50.00	10	40%	8.3	26	12	60.00	10	0	0.00	0	30%	5.0		26	2	10.00	5	0	0.00	0	5%	2.5	27%	5.71
Coarse woody debris	**408**	392	96.08	5	210	51.47	5	370	90.69	5	79%	5.0	384	245	60.05	5	352	86.27	5	73%	5.0		384	0	0.00	0	25	6.13	0	3%	0.0	56%	3.57
Non-native plant cover	**1**	5		5	75		0	15		5		3.3	0	10		5	5		5		5.0		0	5		5	5		5		5.0		4.29
Quality and availability of food and foraging habitat				10			10			10		10.0				10			10		10.0					10			10		10.0		10.00
Quality and availability of shelter				10			10			10		10.0				10			10		10.0					10			10		10.0		10.00
Site Condition Score				79			74			78.5		77.2				82			72		77.0				64.5			61.5		63		73.1
MAX Site Condition Score				*100*			*100*			*100*		*100*				*100*			*100*		*100*				*100*			*100*		*100*		*100*
Site Condition Score - out of 3												**2.32**									**2.31**									**1.89**		**2.19**
Site Context																																	
Size of patch				10			10			10		10.0				10			10		10.0				10			10		10.0		10.00
Connectedness				5			5			5		5.0				5			5		5.0				5			5		5.0		5.00
Context				5			5			5		5.0				5			5		5.0				5			5		5.0		5.00
Ecological Corridors				0			0			0		0.0				0			0		0.0				0			0		0.0		0.00
Threats to the species				1			1			1		1.0				1			1		1.0				1			1		1.0		1.00
Species mobility capacity				7			7			4		6.0				4			4		4.0				4			4		4.0		4.86
Role of site location to species overall population in the state				1			1			1		1.0				1			1		1.0				1			1		1.0		1.00
Site Context Score				29			29			26		28.0				26			26		26				26			26		26		26.9
MAX Site Context Score				*56*			*56*			*56*		*56*				*56*			*56*		*56*				*56*			*56*		*56*		*56*
Site Context Score - out of 3												**1.50**									**1.39**									**1.39**		**1.44**

Species Stocking Rate (SSR)					
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5		10
		No	Yes - adjacent		Yes - on site
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15
		Not habitat	Dispersal	Foraging	Breeding
Approximate density (per ha)	Score	0	10	20	30
		0%			
Role/importance of species population on site*	Score (*Total from supplementary table below*)	0	5	10	15
		0	5 - 15	20 - 35	40 - 45
Total SRR score (out of 70)					
SRR Score (out of 4)					

*SSR Supplementary Table			
*Key source population for breeding	Score	0	10
		No	Yes/ Possibly
*Key source population for dispersal	Score	0	5
		No	Yes/ Possibly
*Necessary for maintaining genetic diversity	Score	0	15
		No	Yes/ Possibly
*Near the limit of the species range	Score	0	15
		No	Yes

Final habitat quality score (weighted)	AU1	AU2	AU3	Average/Final
Site Condition score (out of 3)	2.32	2.31	1.89	
Site Context Score (out of 3)	1.50	1.50	1.39	
Species Stocking Rate Score (out of 4)	0	0	0	
Habitat Quality score (out of 10)	*3.8*	*3.8*	*3.3*	*3.64*
Assessment Unit area (ha)	175	86	29	
Total offset area (ha)	290	290	290	
Size Weighting	0.60	0.30	0.10	
Weighted Habitat Quality Score	***2.30***	***1.14***	***0.32***	***3.8***

OFFSET AREA - Greater Glider

Assessment Unit - Regional Ecosystem	AU 1 - RE 11.12.1 remnant												AU 2 - RE 11.3.4 remnant										AU 3 - RE 11.3.4 non-remnant										average %	average
Site Reference	Benchmark	MSB23			MSB25			MSB31			Average %	Average	Benchmark	MSB24			MSB26			Average %	Average		Benchmark	MSB5			MSB27			Average %	Average			
	11.12.1	Raw Data	% Benchmark	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	benchmar	Score	11.3.4	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	benchmar	Score		11.3.4	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	benchmar	Score			
Site Condition																																		
Recruitment of woody perennial species in EDL	**100**	100	100.00	5	100	100.00	5	80	80.00	5	93%	5.0	100	100	100.00	5	100	100.00	5	100%	5.0		100	60	60.00	3	80	80.00	5	70%	4.0	89%	4.71
Native plant species richness - trees	**3**	4	133.33	5	4	133.33	5	5	166.67	5	144%	5.0	4	6	200.00	5	7	233.33	5	217%	5.0		4	5	166.67	5	5	166.67	5	167%	5.0	171%	5.00
Native plant species richness - shrubs	**6**	2	33.33	3	2	33.33	3	1	16.67	2.5	28%	2.8	2	4	66.67	3	2	33.33	3	50%	3.0		2	0	0.00	2.5	1	16.67	2.5	8%	2.5	29%	2.79
Native plant species richness - grasses	**8**	4	50.00	3	4	50.00	3	2	25.00	3	42%	3.0	7	7	87.50	3	6	75.00	3	81%	3.0		7	4	50.00	3	5	62.50	3	56%	3.0	57%	3.00
Native plant species richness - forbes	**13**	6	46.15	3	12	92.31	5	4	30.77	3	56%	3.7	10	6	46.15	3	7	53.85	3	50%	3.0		10	7	53.85	3	5	38.46	3	46%	3.0	52%	3.29
Tree canopy height (average of emergent, canopy, sub-canopy)	**12.5**	15	120.00	5	12	96.00	5	12.5	100.00	5	105%	5.0	17	16.2	129.60	5	14.8	118.40	5	124%	5.0		17	12.35	98.80	5	12	96.00	5	97%	5.0	108%	5.00
Tree canopy cover (average of emergent, canopy, sub-canopy)	**21**	13.75	65.48	5	28.45	135.48	5	24.65	117.38	5	106%	5.0	11	25	119.05	5	17.55	83.57	5	101%	5.0		11	17.7	84.29	5	10.7	50.95	5	68%	5.0	94%	5.00
Shrub canopy cover	**4**	0	0.00	0	0.9	22.50	3	0.3	7.50	0	10%	1.0	1	0.9	22.50	3	1	25.00	3	24%	3.0		1	0	0.00	0	0	0.00	0	0%	0.0	11%	1.29
Native grass cover	**41**	52	126.83	5	50	121.95	5	40	97.56	5	115%	5.0	43	45	109.76	5	48	117.07	5	113%	5.0		43	33	80.49	3	54	131.71	5	106%	4.0	112%	4.71
Organic litter	**28**	30	107.14	5	33	117.86	5	35	125.00	5	117%	5.0	20	47	167.86	5	27	96.43	5	132%	5.0		20	36.2	129.29	5	25	89.29	3	109%	4.0	119%	4.71
Large trees (euc plus non-euc)	**20**	10	50.00	10	4	20.00	5	10	50.00	10	40%	8.3	26	12	60.00	10	0	0.00	0	30%	5.0		26	2	10.00	5	0	0.00	0	5%	2.5	27%	5.71
Coarse woody debris	**408**	392	96.08	5	210	51.47	5	370	90.69	5	79%	5.0	384	245	60.05	5	352	86.27	5	73%	5.0		384	0	0.00	0	25	6.13	0	3%	0.0	56%	3.57
Non-native plant cover	**1**	5		5	75		0	15		5		3.3	0	10		5	5		5		5.0		0	5		5	5		5		5.0		4.29
Quality and availability of food and foraging habitat				10			10			10		10.0				10			10		10.0					10			10		10.0		10.00
Quality and availability of shelter				10			10			10		10.0				10			10		10.0					10			10		10.0		10.00
Site Condition Score				79			74			78.5		77.2				82			72		77				64.5			61.5		63.0		73.07
MAX Site Condition Score				*100*			*100*			*100*		*100*				*100*			*100*		*100*				*100*			*100*		*100*		*100*
Site Condition Score - out of 3												**2.32**									**2.31**									**1.89**		**2.19**
Site Context																																		
Size of patch				10			10			10		10.0				10			10		10.0				10			10		10		10.00
Connectedness				5			5			5		5.0				5			5		5.0				5			5		5		5.00
Context				5			5			5		5.0				5			5		5.0				5			5		5		5.00
Ecological Corridors				0			0			0		0.0				0			0		0.0				0			0		0		0.00
Threats to the species				7			7			7		7.0				7			7		7.0				7			7		7		7.00
Species mobility capacity				10			10			7		9.0				7			7		7.0				7			7		7		7.86
Role of site location to species overall population in the state				1			1			1		1.0				1			1		1.0				1			1		1		1.00
Site Context Score				38			38			35		37				35			35		35				35			35		35		35.86
MAX Site Context Score				*56*			*56*			*56*		*56*				*56*			*56*		*56*				*56*			*56*		*56*		*56*
Site Context Score - out of 3												**1.98**									**1.88**									**1.88**		**1.92**

Species Stocking Rate (SSR)					
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5	10	
		No	Yes - adjacent	Yes - on site	
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15
		Not habitat	Dispersal	Foraging	Breeding
Approximate density (per ha)	Score	0	10	20	30
		0%			
Role/importance of species population on site*	Score (*Total from supplementary table below*)	0	5	10	15
		0	5 - 15	20 - 35	40 - 45
Total SRR score (out of 70)					
SRR Score (out of 4)					

***SSR Supplementary Table**			
*Key source population for breeding	Score	0	10
		No	Yes/ Possibly
*Key source population for dispersal	Score	0	5
		No	Yes/ Possibly
*Necessary for maintaining genetic diversity	Score	0	15
		No	Yes/ Possibly
*Near the limit of the species range	Score	0	15
		No	Yes

Final habitat quality score (weighted)	**AU1**	**AU2**	**AU3**	**Average/Final**
Site Condition score (out of 3)	2.32	2.31	1.89	*2.17*
Site Context Score (out of 3)	1.98	1.88	1.88	*1.91*
Species Stocking Rate Score (out of 4)	0	0	0	
Habitat Quality score (out of 10)	*4.3*	*4.2*	*3.8*	*4.08*
Assessment Unit area (ha)	175	86	29	
Total offset area (ha)	290	290	290	
Size Weighting	0.60	0.30	0.10	
Weighted Habitat Quality Score	***2.59***	***1.25***	***0.37***	***4.2***

OFFSET AREA - Squatter Pigeon

Assessment Unit - Regional Ecosystem	AU 1 - RE 11.12.1 remnant											AU 2 - RE 11.3.4 remnant								AU 3 - RE 11.3.4 non-remnant								Total	Total
Site Reference	Benchmark	MSB23			MSB25			MSB31			Average	Average	Benchmar	MSB24			MSB26			Average	Average	Benchmar	MSB5			MSB27			Average %	Average		
	11.12.1	Raw Data	% Benchmark	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	%	Score	11.3.4	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	%	Score	11.3.4	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	benchmar	Score		
Site Condition																															
Recruitment of woody perennial species in EDL	**100**	100	100.00	5	100	100.00	5	80	80.00	5	93%	5.0	100	100	100.00	5	100	100.00	5	100%	5.0	100	60	60.00	3	80	80.00	5	70%	4.0	89%	4.71
Native plant species richness - trees	**3**	4	133.33	5	4	133.33	5	5	166.67	5	144%	5.0	4	6	200.00	5	7	233.33	5	217%	5.0	4	5	166.67	5	5	166.67	5	167%	5.0	171%	5.00
Native plant species richness - shrubs	**6**	2	33.33	3	2	33.33	3	1	16.67	2.5	28%	2.8	2	4	66.67	3	2	33.33	3	50%	3.0	2	0	0.00	2.5	1	16.67	2.5	8%	2.5	29%	2.79
Native plant species richness - grasses	**8**	4	50.00	3	4	50.00	3	2	25.00	3	42%	3.0	7	7	87.50	3	6	75.00	3	81%	3.0	7	4	50.00	3	5	62.50	3	56%	3.0	57%	3.00
Native plant species richness - forbes	**13**	6	46.15	3	12	92.31	5	4	30.77	3	56%	3.7	10	6	46.15	3	7	53.85	3	50%	3.0	10	7	53.85	3	5	38.46	3	46%	3.0	52%	3.29
Tree canopy height (average of emergent, canopy, sub-canopy)	**12.5**	15	120.00	5	12	96.00	5	12.5	100.00	5	105%	5.0	17	16.2	129.60	5	14.8	118.40	5	124%	5.0	17	12.35	98.80	5	12	96.00	5	97%	5.0	108%	5.00
Tree canopy cover (average of emergent, canopy, sub-canopy)	**21**	13.75	65.48	5	28.45	135.48	5	24.65	117.38	5	106%	5.0	11	25	119.05	5	17.55	83.57	5	101%	5.0	11	17.7	84.29	5	10.7	50.95	5	68%	5.0	94%	5.00
Shrub canopy cover	**4**	0	0.00	0	0.9	22.50	3	0.3	7.50	0	10%	1.0	1	0.9	22.50	3	1	25.00	3	24%	3.0	1	0	0.00	0	0	0.00	0	0%	0.0	11%	1.29
Native grass cover	**41**	52	126.83	5	50	121.95	5	40	97.56	5	115%	5.0	43	45	109.76	5	48	117.07	5	113%	5.0	43	33	80.49	3	54	131.71	5	106%	4.0	112%	4.71
Organic litter	**28**	30	107.14	5	33	117.86	5	35	125.00	5	117%	5.0	20	47	167.86	5	27	96.43	5	132%	5.0	20	36.2	129.29	5	25	89.29	3	109%	4.0	119%	4.71
Large trees (euc plus non-euc)	**20**	10	50.00	10	4	20.00	5	10	50.00	10	40%	8.3	26	12	60.00	10	0	0.00	0	30%	5.0	26	2	10.00	5	0	0.00	0	5%	2.5	27%	5.71
Coarse woody debris	**408**	392	96.08	5	210	51.47	5	370	90.69	5	79%	5.0	384	245	60.05	5	352	86.27	5	73%	5.0	384	0	0.00	0	25	6.13	0	3%	0.0	56%	3.57
Non-native plant cover	**1**	5		5	75		0	15		5		3.3	0	10		5	5		5		5.0	0	5		5	5		5		5.0		4.29
Quality and availability of food and foraging habitat				10			10			10		10.0				10			10		10.0				10			10		10.0		10.00
Quality and availability of shelter				10			10			10		10.0				10			10		10.0				10			10		10.0		10.00
Site Condition Score				79			74			78.5		77.2				82			72		77.0				64.5			61.5		63.0		73.07
MAX Site Condition Score				*100*			*100*			*100*		*100*				*100*			*100*		*100*				*100*			*100*		*100*		*100*
Site Condition Score - out of 3												**2.32**									**2.31**									**1.89**		**2.19**
Site Context																																
Size of patch				10			10			10		10.0				10			10		10.0				10			**10**		10.0		10.00
Connectedness				5			5			5		5.0				5			5		5.0				5			**5**		5.0		5.00
Context				5			5			5		5.0				5			5		5.0				5			**5**		5.0		5.00
Ecological Corridors				0			0			0		0.0				0			0		0.0				0			0		0.0		0.00
Threats to the species				7			7			7		7.0				7			7		7.0				7			7		7.0		7.00
Species mobility capacity				7			7			4		6.0				7			4		5.5				7			4		5.5		5.71
Role of site location to species overall population in the state				1			1			1		1.0				1			1		1.0				1			1		1.0		1.00
Site Context Score				35			35			32		34.0				35			32		33.5				35			32		33.5		33.71
MAX Site Context Score				*56*			*56*			*56*		*56*				*56*			*56*		*56*				*56*			*56*		*56*		*56*
Site Context Score - out of 3												**1.82**									**1.79**									**1.79**		**1.81**

Species Stocking Rate (SSR)						
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0		5		10
		No		Yes - adjacent		Yes - on site
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10		15
		Not habitat	Dispersal	Foraging		Breeding
Approximate density (per ha)	Score	0	10	20		30
		0%				
Role/importance of species population on site*	Score (*Total from supplementary table below*)	0	5		10	15
		0	5 - 15	20 - 35		40 - 45
Total SRR score (out of 70)						
SRR Score (out of 4)						

***SSR Supplementary Table**			
*Key source population for breeding	Score	0	10
		No	Yes/ Possibly
*Key source population for dispersal	Score	0	5
		No	Yes/ Possibly
*Necessary for maintaining genetic diversity	Score	0	15
		No	Yes/ Possibly
*Near the limit of the species range	Score	0	15
		No	Yes

Final habitat quality score (weighted)	**AU1**	**AU2**	**AU3**	**Average/Final**
Site Condition score (out of 3)	2.32	2.31	1.89	
Site Context Score (out of 3)	1.82	1.79	1.79	
Species Stocking Rate Score (out of 4)	0	0	0	
Habitat Quality score (out of 10)	*4.1*	*4.1*	*3.7*	*3.98*
Assessment Unit area (ha)	175	86	29	
Total offset area (ha)	290	290	290	
Size Weighting	0.60	0.30	0.10	
Weighted Habitat Quality Score	***2.50***	***1.22***	***0.36***	***4.1***

Appendix E

EPBC Offset Calculator Results

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Refer to supporting documentation	**Area**	125	Hectares	Refer to supporting documentation
			Quality	**3**	Scale 0-10	
			Total quantum of impact	37.50	Adjusted hectares	
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	37.50	Adjusted hectares	Refer to supporting documentation	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	217	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	90%	0.00	0.00	37.53	100.08%	Yes	
									Future area without offset (adjusted hectares)	217.0	**Future area with offset (adjusted hectares)**	217.0								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	4	**Future quality without offset (scale of 0-10)**	4	**Future quality with offset (scale of 0-10)**	6	2.00	90%	1.80	1.73				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Greater Glider
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Refer to supporting documentation	**Area**	125	Hectares	Refer to supporting documentation
			Quality	**4**	Scale 0-10	
			Total quantum of impact	50.00	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.c.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	50.00	Adjusted hectares	Refer to supporting documentation	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	290	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	90%	0.00	0.00	50.16	100.31%	Yes	
									Future area without offset (adjusted hectares)	290.0	**Future area with offset (adjusted hectares)**	290.0								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	4	**Future quality without offset (scale of 0-10)**	4	**Future quality with offset (scale of 0-10)**	6	2.00	90%	1.80	1.73				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Squatter Pigeon
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	74	Hectares	Refer to supporting documentation
			Quality	**4**	Scale 0-10	
			Total quantum of impact	29.60	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	29.60	Adjusted hectares	Refer to supporting documentation	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	172	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	100%	0.00	0.00	100.50%	Yes		
									Future area without offset (adjusted hectares)	172.0	**Future area with offset (adjusted hectares)**	172.0								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**4**	**Future quality without offset (scale of 0-10)**	**4**	**Future quality with offset (scale of 0-10)**	**6**	2.00	90%	1.80	1.73				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Appendix F

Regional Ecosystem Fire Management Guidelines

RE index	Bioregion	Regional Ecosystem	Description label	Fire guidelines
110304	BRB	11.3.4	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	SEASON: Late wet to early dry season when there is good soil moisture. Early storm season or after good spring rains. INTENSITY: Low to moderate. INTERVAL: 6-10 years (shorter in north of bioregion: 2 - 7 years). STRATEGY: Restrict to less than 30% in any year. Burn under conditions of good soil moisture and when plants are actively growing. Sometimes a small amount of wind may move the fire front quickly so that burn intensity is not too severe to destroy habitat trees. ISSUES: Burn interval for conservation purposes will differ from that for grazing purposes; the latter being much shorter. Management of this vegetation type should be based on maintaining vegetation composition, structural diversity, fauna habitats (in particular hollow-bearing trees and logs) and preventing extensive wildfire. Maintaining a fire mosaic will help ensure protection of habitat and mitigate against wildfires. Fire can control shrub invasives (e.g., Eremophila spp. and A. stenophylla in the red soil country in particular). Fire will also control cypress. Low to moderate intensity burns with good soil moisture are necessary to minimise loss of hollow trees. Avoid burning riparian communities as these can be critical habitat for some species. Culturally significant (scar) trees may need protection, such as rake removal of ground fuels. Planned burns have traditionally been carried out in the winter dry season; further research required.
111201	BRB	11.12.1	Eucalyptus crebra woodland on igneous rocks	SEASON: Late wet to early dry season when there is good soil moisture. Early storm season or after good spring rains. INTENSITY: Various. b, c: Various. Mainly low, but also moderate. INTERVAL: 6-15 years (shorter intervals north of bioregion 5 - 10 years). b, c: >3years. STRATEGY: Burn less than 30% in any year. Burn under conditions of good soil moisture and when plants are actively growing. All shrubby areas will carry fire after a good season. b, c: Low to moderate burns can help limit the spread of fires. Burn less than 30% in any year. Burn under conditions of good soil moisture and when plants are actively growing. ISSUES: Management of this fire tolerant vegetation type should be based on maintaining vegetation composition, structural diversity, animal habitats and preventing extensive wildfire. Maintaining a fire mosaic will ensure protection of habitat and mitigate against wildfires. Planned burns have traditionally been carried out in the winter dry season; further research required. b, c: Fire can be used to control weed invasions, although there are also risks of promoting weeds.