Projects Group

BMA
BHP Billiton Mitsubishi Alliance

Dysart Road and Infrastructure Relocation Project
Definition Phase Study

Document No: PDM4554-0000-VM-PL-2001

Species Management Plan

Revision Approvals			
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1	06/12/13	Amendments pursuant to DoE review and rectification of minor typographical errors	SW	BG	BG
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Rev.	**Date**	**Description**	**Orig.**	**Review.**	**Appr.**

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ABBREVIATIONS AND DEFINITIONS

ABBREVIATION	DESCRIPTION
BMA	BM Alliance Coal Operations Pty Ltd
Brigalow TEC	Term used to collectively refer to all vegetation that meets the definition of the Brigalow (*Acacia harpophylla* dominant and co-dominant) threatened ecological community under the EPBC Act. This definition encompasses a number of Queensland Regional Ecosystems.
DAFF	Queensland Department of Agriculture, Fisheries and Forestry
DEHP	Queensland Department of Environment and Heritage Protection
DNRM	Queensland Department of Natural Resources and Mines
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
Fauna	Any taxon or species of fauna native to Queensland
Flora	Any taxon or species of flora native to Queensland
Natural Grasslands TEC	Term used to collectively refer to all vegetation that meets the definition of the Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin threatened ecological community under the EPBC Act. This definition encompasses a number of Queensland Regional Ecosystems.
NC Act	Queensland *Nature Conservation Act 1992*
RE	Regional Ecosystem. REs are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil.
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities.
TEC	Threatened Ecological Community, as defined under the EPBC Act.
The plan	This Species Management Plan.
The project	The proposed Dysart Road and Associated Infrastructure Relocation Project.
VM Act	Queensland *Vegetation Management Act 1999*

1 INTRODUCTION

BM Alliance Coal Operations Pty Ltd (BMA) proposes to realign a part of Dysart Road, within Lot 6 on SP174999 (now Lot 8 on SP244492) and Lot 5 on SP110795 located between Moranbah and Dysart in the Bowen Basin (Figure 1). This section of the road, and associated Telstra fibre optic cabling, needs to be realigned and repositioned further to the north due to the operational expansion of Peak Downs Mine within ML1775.

This project will maintain the road link between Moranbah and the Peak Downs Highway to the north-west with Dysart to the south-east. It is proposed to establish a new road reserve to accommodate a 30m wide, approximately 16km long realignment of part of the existing road and re-position it approximately 1.6km to the north (Figure 2).

Provision has been made for a 60m road corridor to accommodate the Telstra fibre optic cable, as well as laydown areas and service roads should these be required (Figure 3). The outer extent of the road corridor will be fenced with the Telstra cable set back approximately 5 metres off the northern/southern boundary line. The width of this corridor has been narrowed to 26.6m in one area to reduce the potential for impact on adjoining significant vegetation communities.

Following construction and opening of the length of new road the existing road will be closed and the road reserve extinguished. A new at grade level crossing across the Peak Downs Railway corridor (Lot 2 on CNS79) is also proposed.

For the purpose of this Species Management Plan (the plan) the project refers to the extent of works required for the relocation of Dysart Road and associated infrastructure. The impacts of this project have been based on the expectation that all vegetation within the road corridor will be cleared; however, vegetation within this area will be retained where this is feasible.

On 17 May 2013 the proposal was referred to the Commonwealth Department of Environment, Water, Sustainability, Population and Communities (SEWPaC) for an assessment of potential impacts to Matters of National Environmental Significance (EPBC 2013/6868). On 19 June 2013 a decision on assessment approach was issued indicating that the project is a controlled action and that assessment under the *Environment Protection and Biodiversity Act 1999* (EPBC Act) would be required by way of Preliminary Documentation. Relevant controlling provisions were identified as listed threatened species and communities (sections 18 and 18A). A decision for the application was issued on 5 November 2013.

At the State level, an application has been made to Isaac Regional Council for approval of the proposed development under the *Sustainable Planning Act 2009*. On 26 April 2013 this application was referred to the Queensland Department of Natural Resources and Mines (DNRM) as a Concurrence Agency for the assessment of clearing of native vegetation protected under the *Vegetation Management Act 1999*. A Referral Agency Response approving this vegetation clearing was issued on 12 July 2013. On 3 October 2013, BMA received the decision notice from the Isaac Regional Council providing the required approval for the Reconfiguration of a Lot (Road Opening) and Operational Work for clearance of native vegetation made assessable under the Planning Scheme.

A number of additional State approvals will be required for the project, including:

- Clearing Permit (protected plants) for approval to clear protected vegetation under the *Nature Conservation Act 1992* (NC Act).
- Permit under the NC Act to interfere with protected wildlife and its habitat.
- Permit under the NC Act to clear Near Threatened and Least Concern protected flora on freehold land.
- Riverine Protection Permit under the *Water Act 2000*.

This SMP has been produced with a focus on its end users (i.e. the road realignment contractor, on-ground personnel and environmental supervisors). It has been designed to provide specific guidance relating to the management of flora and fauna values during the construction phase. Furthermore, it is also intended to demonstrate compliance with State and Federal Government requirements by informing regulators of the on-ground actions that will be implemented to protect these values within the project area.

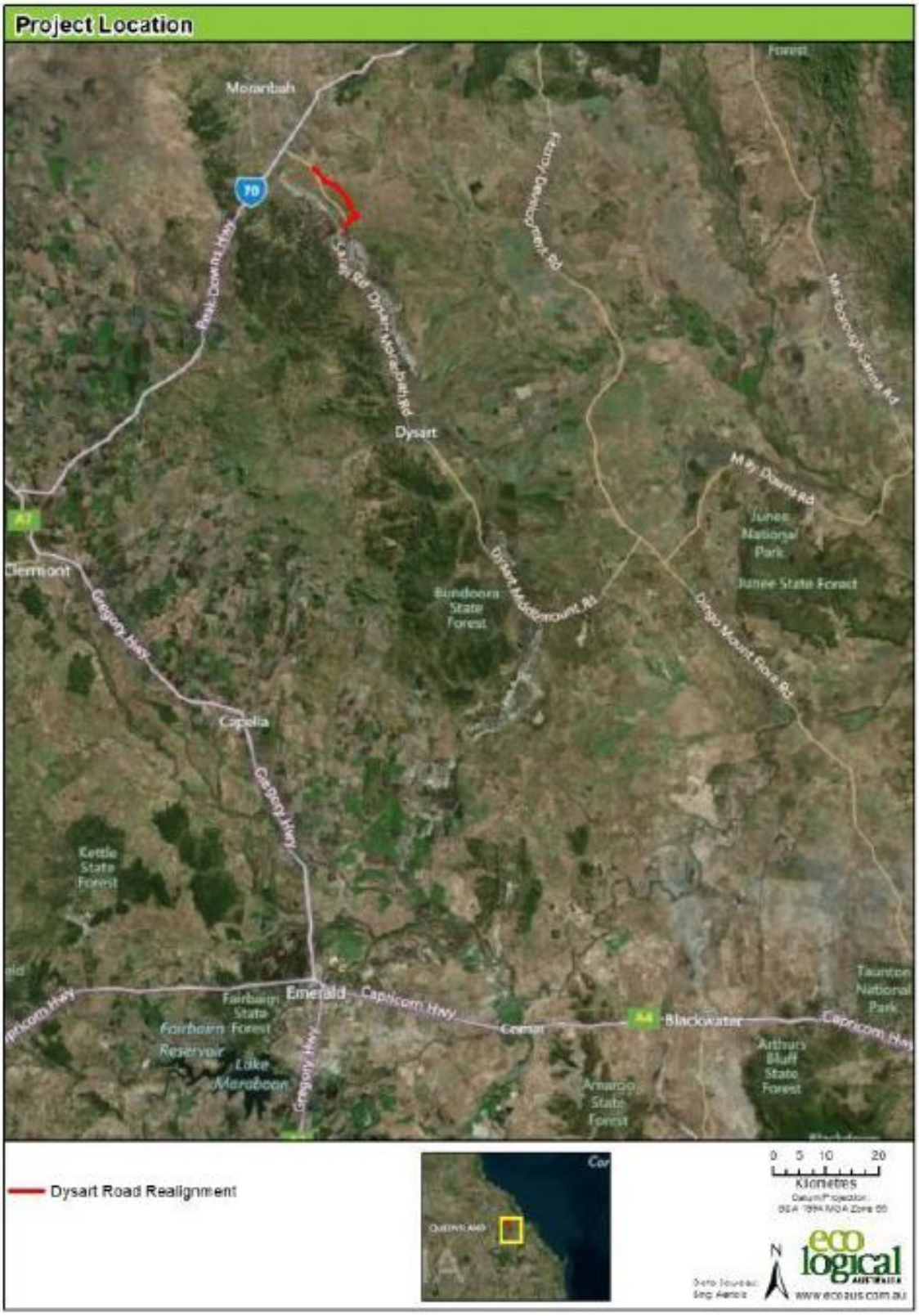


Figure 1 Project Location

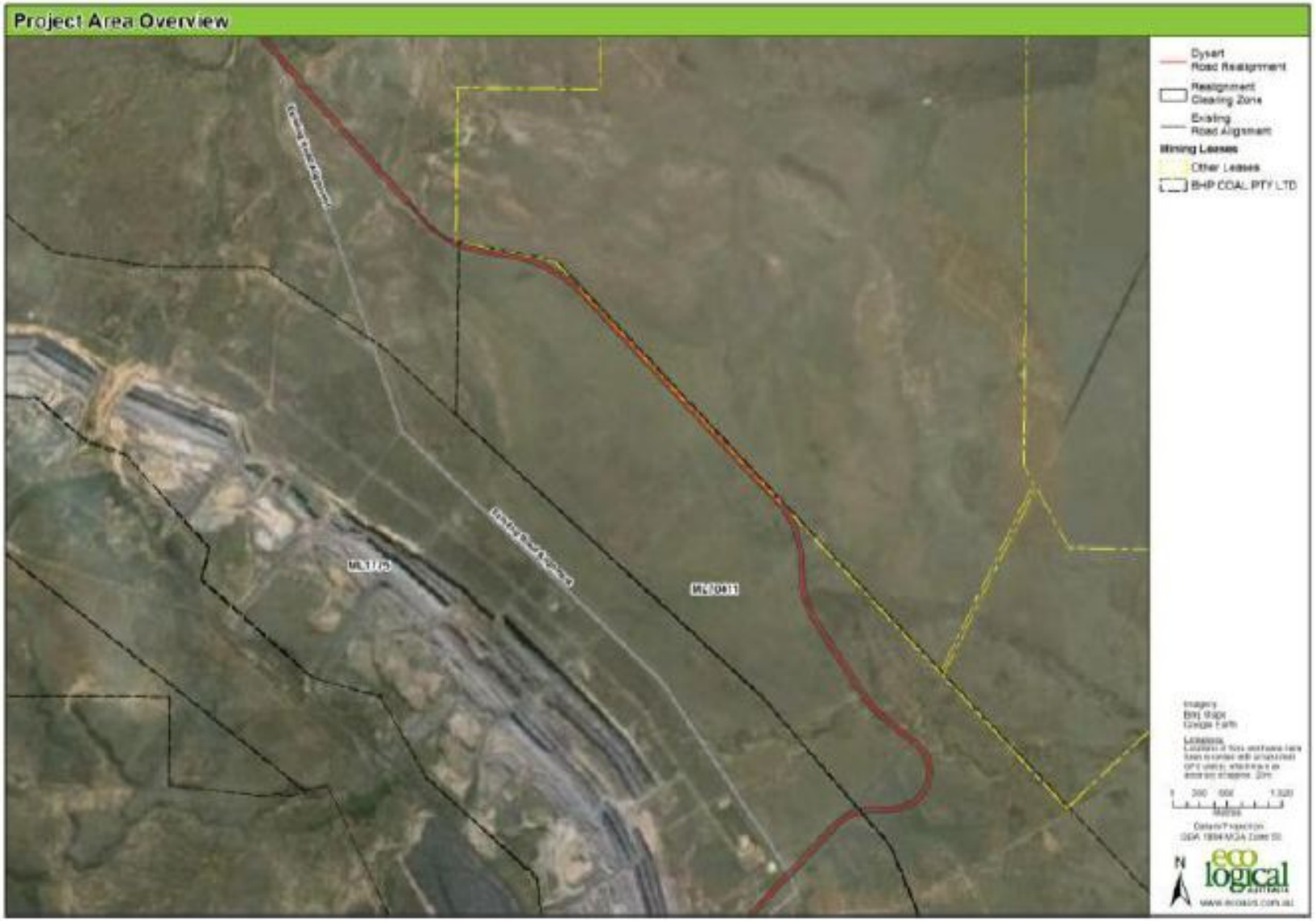


Figure 2 Overview of the Project Area

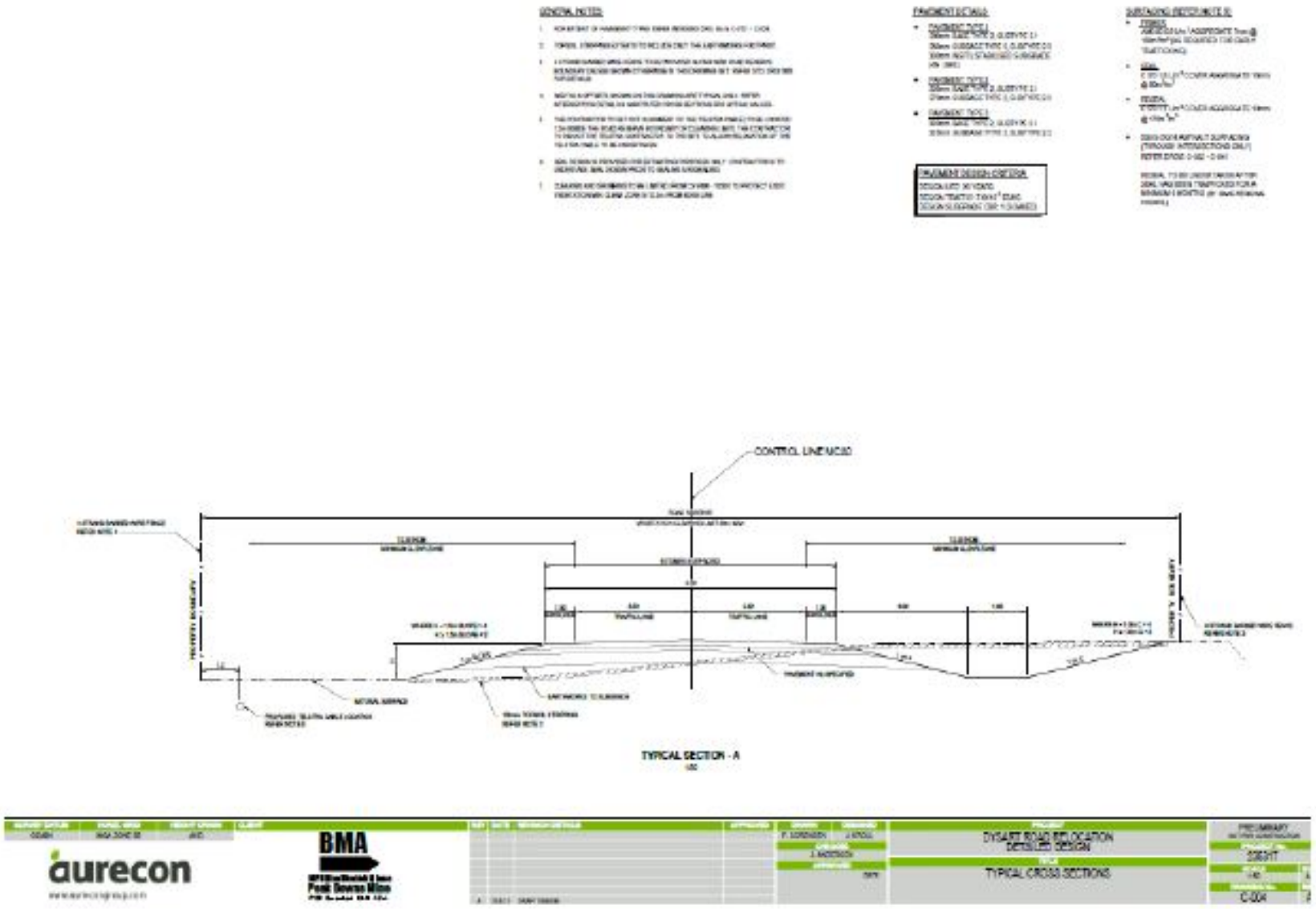


Figure 3 Typical Cross-Section of Dysart Road

2 BACKGROUND

This section details the legislative requirements that have shaped this plan and also provides a brief description of the existing environment associated with the proposed road relocation.

The proposed realignment is situated between the towns of Dysart and Moranbah, located between 46km and 62km north of Dysart. The landform within the project area is relatively flat and the project footprint traverses land that is mainly cleared or disturbed. A number of ephemeral waterways are traversed by the proposed alignment; however these have been identified as likely to be dry for the majority of the year (BMA, 2013).

Cattle grazing is the predominant land use in the surrounding area and historical land uses in the project area have related to both cattle grazing and mining activities. Subsequently the area has been subject to weed infestation by species such as Buffel Grass (*Cenchrus ciliaris*) and Parthenium (*Parthenium hysterophorus*). As a consequence, degradation by exotic pasture species has resulted in the suppression and exclusion of native species in some areas. However, patches of remnant, regrowth and non-remnant vegetation of varying condition still persist within the landscape, with a number of woodland and grassland communities occurring in proximity to the proposed realignment.

2.1 LEGISLATIVE REQUIREMENTS

The Federal assessment of the project has involved referral of the project to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) for assessment under the EPBC Act. The project was deemed a Controlled Action requiring assessment and approval.

The State application process has involved the submission of a Reconfiguring a Lot application to Isaac Regional Council. The proposal has also been referred to the Department of Natural Resources and Mines (DNRM) as a Concurrence Agency for clearing native vegetation and also to the Department of Transport and Main Roads (DTMR)

In addition to a development application, as the project will involve the taking or destruction of protected plants in the wild, and activities that will involve tampering with animal breeding places, permits will be required under the *Nature Conservation Act 1992* (NC Act).

As a requirement of Section 332 of the *Nature Conservation (Wildlife Management) Regulation 2006,* a person must not, without a reasonable excuse, tamper with an animal breeding place that is being used by a protected animal. The project area is not known to contain suitable breeding habitat for any protected animals. As such, it is not likely that a breeding place of a protected species inside the project area will be tampered with. To ensure that breeding places immediately outside or adjacent to the project area are not impacted, a range of mitigation measures including dust suppression, and fencing will be implemented (refer to Section 6 for further details).

This Species Management Plan (SMP) has been prepared to direct on-ground management activities and to inform regulatory agencies of the management measures being employed relating to protected species, vegetation and ecological communities.

The State and Commonwealth Government requirements relevant to this SMP are included in the Appendices of this plan.

2.2 BMA ENVIRONMENTAL POLICY

The project is committed to the protection and management of the environment and activities will be performed in a manner that prevents pollution, promotes sustainability and minimises environmental impacts to native flora, fauna and ecological communities. The project will adopt a zero harm policy and will be undertaken in accordance with BHP Billiton's broader Environmental Policy (POL.004 – Sustainable Development Policy), BMA's Environmental Management System, the BMA Charter, and internal governance procedures and standards.

This commitment is achieved by:

- continual improvement of environmental performance;
- timely and effective responses to non-conformance issues;
- ongoing environmental awareness training for all employees on the project; and
- regular monitoring, auditing and reviewing of compliance with this plan, applicable legislation, regulations and environmental authorities.

3 PURPOSE OF THIS PLAN

This plan has been prepared to outline the management actions that will be implemented as part of the project to mitigate impacts on flora, fauna and communities.

The aim of the plan is to ensure that impacts to native species and/or ecological communities are minimised. In particular, the plan aims to:

- contribute to the survival of the species or community in the wild;
- achieve conservation benefits and maintain the ecological value of a species or community;
- protect and conserve threatened species and ecological communities, and regional biodiversity value;
- describe the responsibilities and actions required during the various project phases to maintain compliance with environmental requirements, commitments, and to address unanticipated discoveries;
- implement management practices for the protection and conservation of flora and fauna; and
- provide a framework for inspections and monitoring to evaluate compliance with flora and fauna protection requirements.

The SMP has been designed to be an operational document that provides site staff with clearly defined activities for managing flora and fauna values during the construction phase of the project. Further detail describing how the plan is to be read and implemented is provided in Section 6.

This plan relates to the construction of the Dysart Road and Associated Infrastructure Relocation project. Should any particular component of the project not proceed the management measures and actions detailed in this plan that are no longer relevant or applicable will not be implemented.

4 ROLES AND RESPONSIBILITIES

This plan will be implemented by the BMA Dysart Road and Associated Infrastructure Relocation Project Manager (or their delegate) and the Site Environmental Representatives as detailed in Table 1.

Table 1: Roles and Responsibilities

Title	Company	Roles and Responsibilities
Project Manager	BMA	Responsible for providing adequate resources for the implementation of the Species Management Plan.
Site Supervisor	Construction Contractor	Responsible for coordinating the day to day implementation of the Species Management Plan, including the routine and reactive management and monitoring activities outlined in Section 6 of this plan. Shall ensure that personnel involved in the implementation and monitoring of the values and activities in the Species Management Plan are suitably qualified and trained to perform the task(s).
Environmental Officer	BMA	Responsible for undertaking auditing and reporting to assess compliance with the management and monitoring activities required by this SMP.
Spotter Catchers	Suitably qualified and experienced person(s)	Responsible for providing skills and expertise in the execution of management measures prescribed in the plan.

5 EXISTING ENVIRONMENT

The description of ecological values identified within the project area is based on the information presented in the following documents prepared in support of the project.

ECOLOGICAL ASSESSMENT (AURECON HATCH, 2012B)

An Ecological Assessment was undertaken by Aurecon Hatch to assess the flora and fauna values associated with the proposed realignment of Dysart Road. Surveys were undertaken between 9-14 October 2011 and 11-15 February 2012.

ECOLOGICAL ASSESSMENT (AURECON, 2013B)

Following a redesign of the Dysart Road realignment pursuant to the 2011-2012 ecological surveys, Aurecon undertook supplementary flora and fauna surveys to ground-truth the ecological values located within the new proposed road alignment. Fieldwork was undertaken during 10-15 December 2012 and 14-19 January 2013.

PRELIMINARY DOCUMENTATION (BMA, 2013)

From 14-18 May 2013, Eco Logical Australia (BMA, 2013) conducted flora and fauna surveys that targeted Matters of National Environmental Significance (MNES) within the proposed road realignment. These surveys were undertaken as part of the preparation of the Preliminary Documentation for the project and were designed to inform SEWPaC's assessment of the likelihood of significant impact to MNES from the project.

5.1 SUMMARY OF SIGNIFICANT ECOLOGICAL VALUES

5.1.1 ECOLOGICAL COMMUNITIES AND REGIONAL ECOSYSTEMS

A total of eight (8) Regional Ecosystems (REs) have been identified by Aurecon as being subject to disturbance within the project area (Table 2). Four (4) of these REs are listed as threatened vegetation communities within Queensland.

Additionally, Eco Logical Australia identified that 10.2ha of the Natural Grassland TEC, analogous to RE 11.8.11, listed as Endangered under the EPBC Act, will also be impacted by the realignment (BMA, 2013).

Table 2: Regional Ecosystem Disturbance Areas

Regional Ecosystem	VM Act Status	Extent of Disturbance
11.3.2	Of Concern	0.56ha
11.3.25	Least Concern	0.74ha
11.4.9	Endangered	0.45ha
11.5.3	Least Concern	5.42ha
11.8.5	Least Concern	9.69ha
11.8.11	Of Concern	10.2ha

Regional Ecosystem	VM Act Status	Extent of Disturbance
11.9.2/11.9.5	Least Concern/Endangered	2.43ha
11.9.3/11.9.2	Least Concern/Least Concern	2.09ha
11.9.5	Endangered	0.02ha
Non-remnant	-	71.87ha

5.1.2 FLORA

Two flora species listed as significant under the NC Act were recorded in the project area during field surveys (Table 3).

Table 3: Significant Flora within the Project Area

Scientific Name	Common Name	NC Act Status	EPBC Act Status
Desmodium macrocarpum	-	Near Threatened	-
Cymbidium canaliculatum	Black Orchid	Type A Restricted Plant	-

No species listed as threatened under the EPBC Act were observed. However, potential habitat was recorded for an additional two species significant under the EPBC and NC Acts:

- King Bluegrass (*Dichanthium queenslandicum*) – Vulnerable EPBC Act, Vulnerable NC Act; and
- Finger Panic Grass (*Digitaria porrecta*) – Endangered EPBC Act, Near Threatened NC Act.

Although neither species has ever been recorded on site, there is a reasonable probability of occurrence on site in Regional Ecosystems 11.8.5 and 11.8.11.

5.1.3 FAUNA

Seven (7) fauna species significant at either a State and/or Federal Level have been identified within the project area (Table 4).

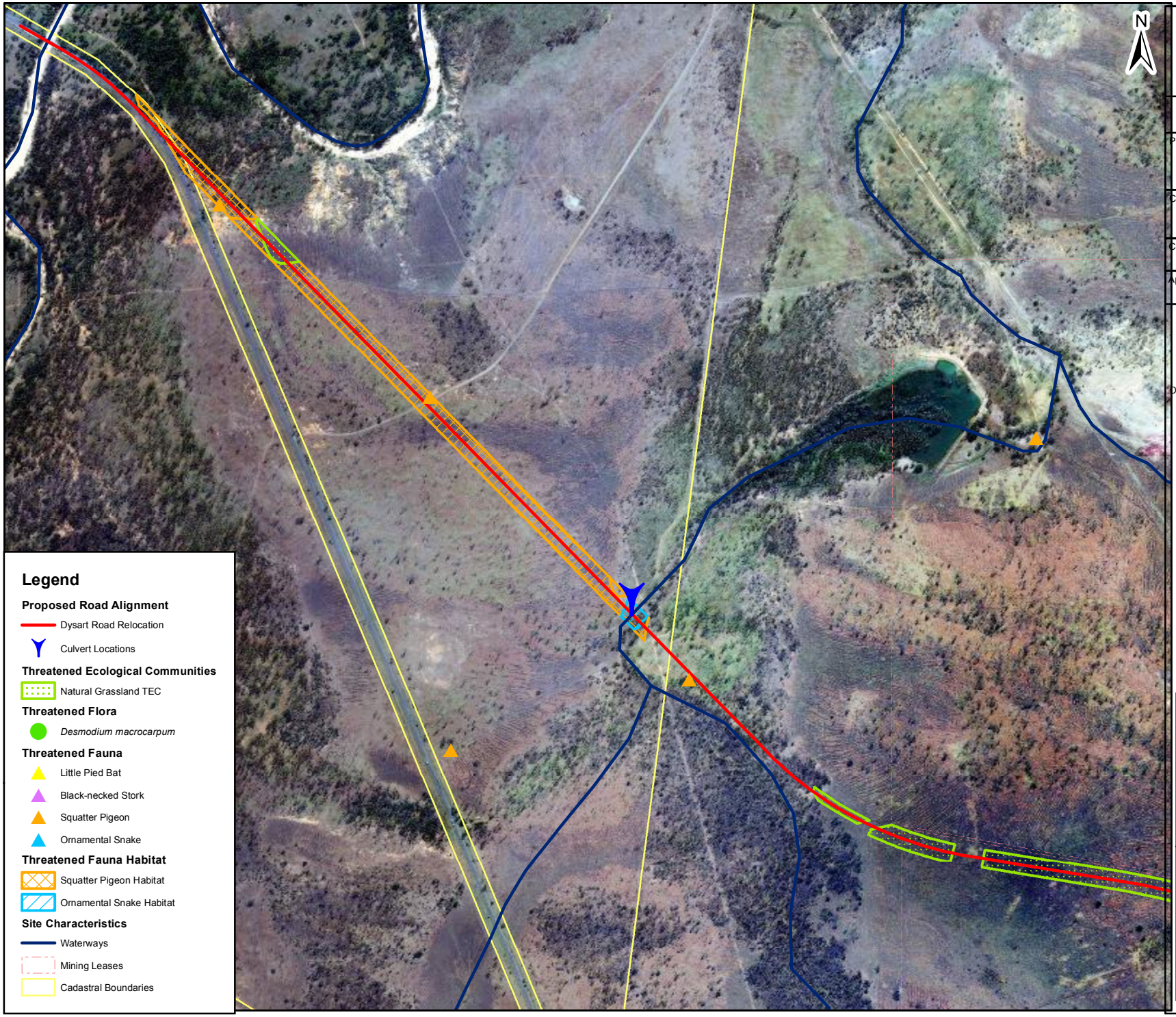
Table 4: Significant Fauna within the Project Area

Scientific Name	Common Name	NC Act Status	EPBC Act Status
Reptiles			
Denisonia maculata	Ornamental Snake	Vulnerable	Vulnerable
Birds			
Apus pacificus	Fork-tailed Swift	-	Migratory
Ardea alba	Great Egret		Migratory
Ephippiorhynchus asiaticus	Black-necked Stork	Near Threatened	-
Geophaps scripta scripta	Squatter Pigeon	Vulnerable	Vulnerable
Merops ornatus	Rainbow Bee-eater		Migratory
Mammals			
Chalinolobus pictatus	Little Pied Bat	Near Threatened	-

In addition to these, potential habitat has been identified for a further five (5) significant species:

- Yakka Skink (*Egernia rugosa*) - Vulnerable NC Act, Vulnerable EPBC Act;
- Dunmall's Snake (*Furnia dunmalli*) - Vulnerable NC Act, Vulnerable EPBC Act;
- Allan's Lerista (*Lerista allanae*) - Endangered NC Act, Endangered EPBC Act;
- South-eastern Long-eared Bat (*Nyctophilus corbeni*) - Vulnerable NC Act, Vulnerable EPBC Act; and
- Koala (*Phascolarctos cinereus*) - Vulnerable NC Act, Vulnerable EPBC Act.

Figures 4a-d detail the location of all significant species recorded within the project area.



Threatened Species and Ecological Communities Recorded within the Project Area

(Sheet 1 of 4)

Figure 4a

Project: Dysart Road and Associated Infrastructure Relocation Project

Client: BMA

Compiled by:	SW	Date:	08/11/2013
Approved by:	KM	Date:	08/11/2013

Source: Aerial photography provided by Bing Maps, 2013
Cadastre and mining lease data provided by Queensland Government, 2013
Threatened species and communities data provided by Aurecon, 2013 and Eco Logical Australia, 2013

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

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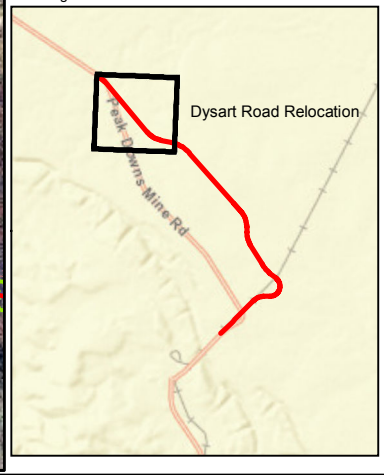
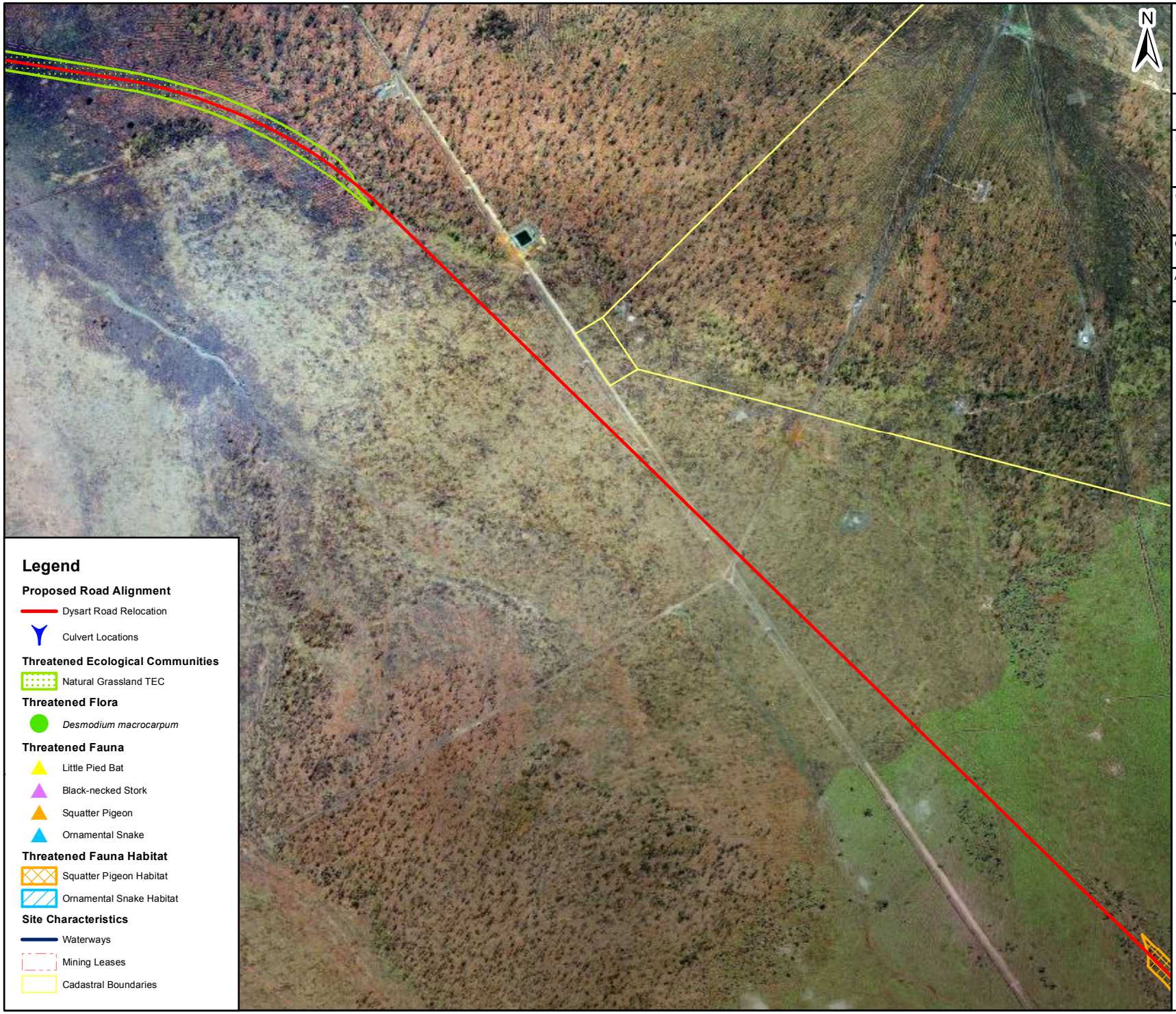
Tracking number: PR109778-3 10/10/2013





Legend

Proposed Road Alignment
- Dysart Road Relocation
- Culvert Locations

Threatened Ecological Communities
- Natural Grassland TEC

Threatened Flora
- *Desmodium macrocarpum*

Threatened Fauna
- Little Pied Bat
- Black-necked Stork
- Squatter Pigeon
- Ornamental Snake

Threatened Fauna Habitat
- Squatter Pigeon Habitat
- Ornamental Snake Habitat

Site Characteristics
- Waterways
- Mining Leases
- Cadastral Boundaries

Threatened Species and Ecological Communities Recorded within the Project Area

(Sheet 2 of 4)

Figure 4b

Project: Dysart Road and Associated Infrastructure Relocation Project

Client: BMA

Compiled by:	SW	Date:	08/11/2013
Approved by:	KM	Date:	08/11/2013

Source: Aerial photography provided by Bing Maps, 2013
Cadastre and mining lease data provided by Queensland Government, 2013
Threatened species and communities data provided by Aurecon, 2013 and Eco Logical Australia, 2013

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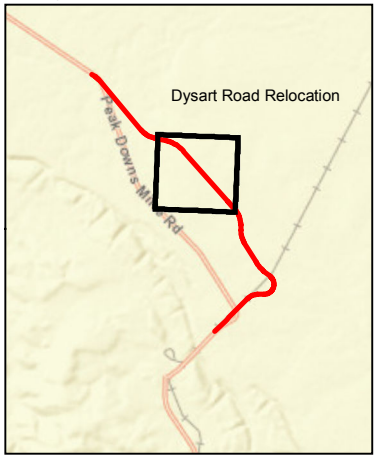
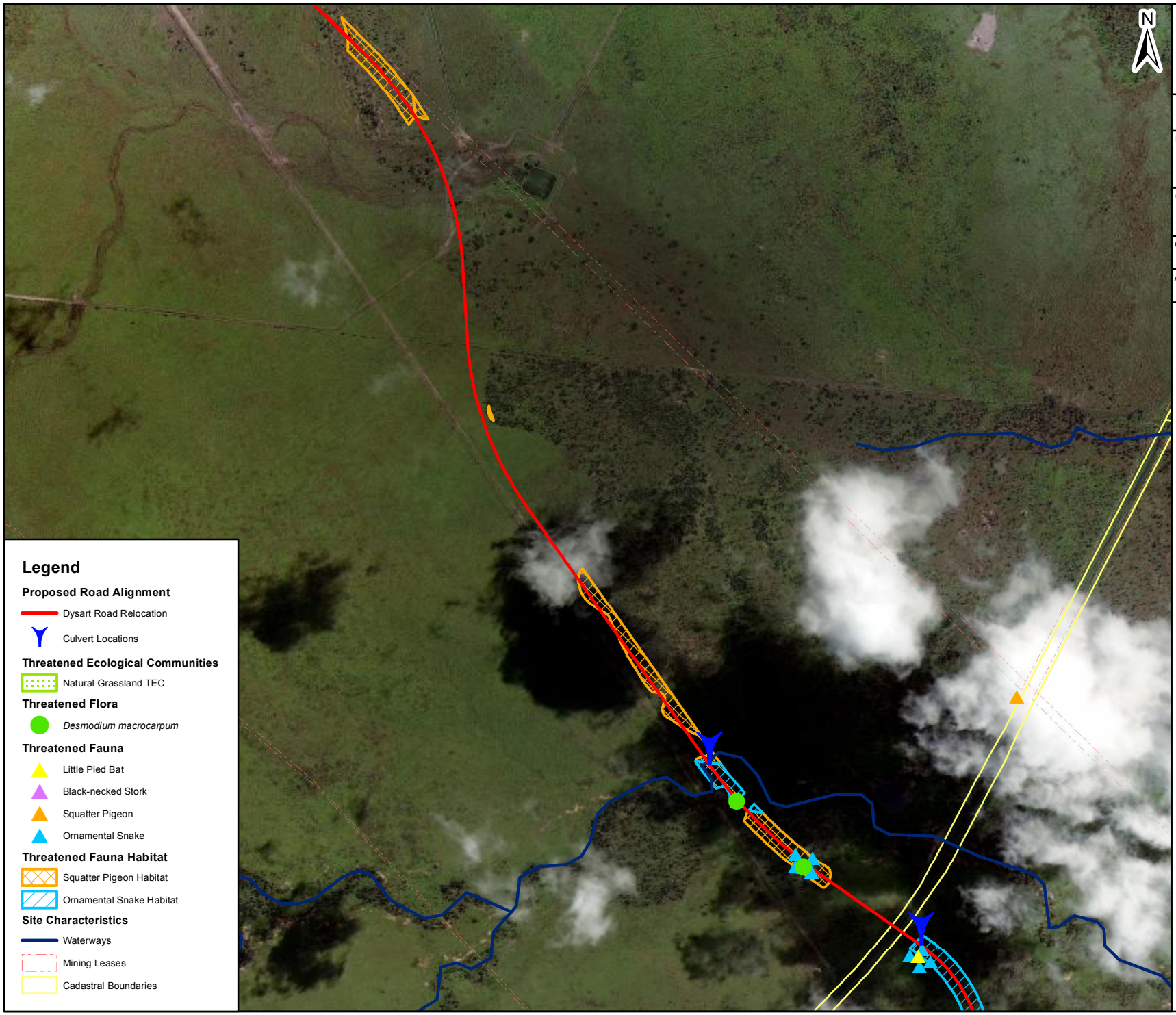
Tracking number: PR109778-3 10/10/2013





Threatened Species and Ecological Communities Recorded within the Project Area

(Sheet 3 of 4)

Figure 4c

Project: Dysart Road and Associated Infrastructure Relocation Project

Client: BMA

Compiled by:	SW	Date:	08/11/2013
Approved by:	KM	Date:	08/11/2013

Source: Aerial photography provided by Bing Maps, 2013
Cadastre and mining lease data provided by Queensland Government, 2013
Threatened species and communities data provided by Aurecon, 2013 and Eco Logical Australia, 2013

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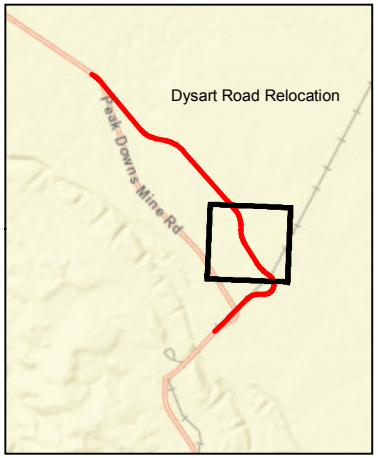
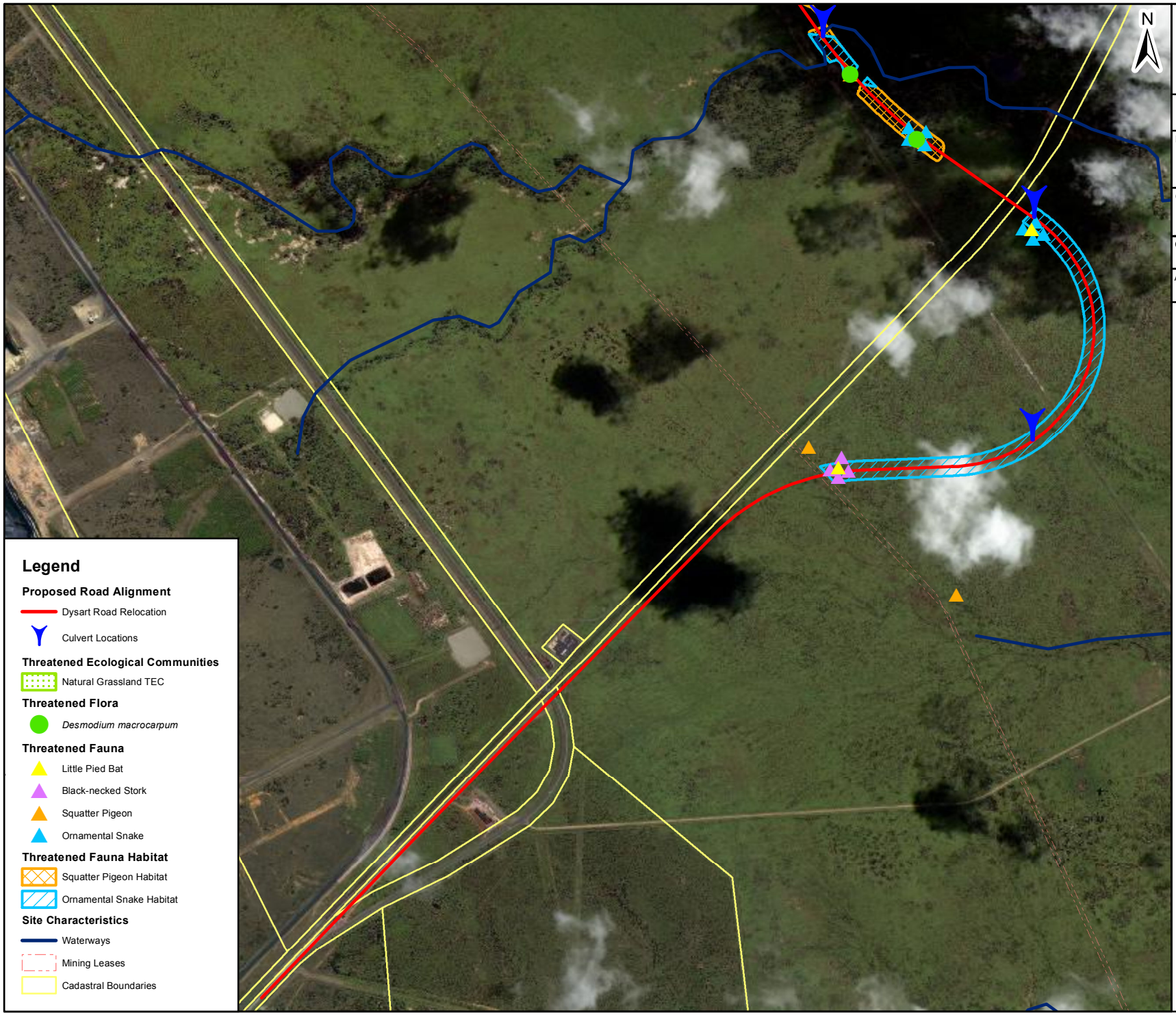
Tracking number: PR109778-3 10/10/2013





Threatened Species and Ecological Communities Recorded within the Project Area

(Sheet 4 of 4)

Figure 4d

Project: Dysart Road and Associated Infrastructure Relocation Project

Client: BMA

Compiled by:	SW	Date:	08/11/2013
Approved by:	KM	Date:	08/11/2013

Source: Aerial photography provided by Bing Maps, 2013
Cadastre and mining lease data provided by Queensland Government, 2013
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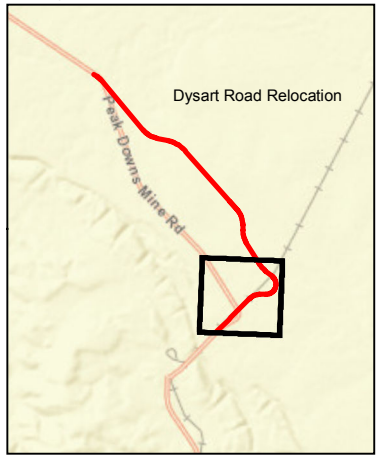

6 MANAGEMENT ACTIONS AND MITIGATION MEASURES

The Dysart Road and Infrastructure Relocation Project has the potential to adversely affect ecological values within the development footprint through impacts associated with factors including: dust, erosion, sedimentation, noise, bushfire, vegetation clearing, habitat loss and degradation, and disturbance to fauna during construction activities.

The following management actions and mitigation measures have been designed to ensure that potential impacts to native flora, fauna and ecological communities associated with the construction and operation of the project are minimised. They aim to contribute to the survival of these species and ecological communities in the wild and provide an overall conservation benefit.

Management actions and mitigation measures have been developed with the Department of Environment and Heritage Protection's (DEHP) hierarchy of rehabilitation objectives in mind. This hierarchy is listed below in order of decreasing capacity to prevent or minimise environmental harm:

- avoid disturbance that will require rehabilitation.
- reinstate a natural ecosystem as similar as possible to the original ecosystem.
- develop an alternative outcome with a higher economic value than the previous land use.
- reinstate previous land use.
- develop lower value land use.

As mentioned above in Section 5, a number of vegetation communities, including REs listed under the VM Act and TECs listed under the EPBC Act, will potentially be disturbed as a result of the construction and operation of the project. As such, a range of mitigation measures have been developed. These measures will be implemented to ensure that impacts are kept to a minimum and that the project does not adversely affect the survival of these communities.

This plan has been designed to be an operational document for use by site staff during the construction of the project. It contains management strategies applicable to all flora and fauna values in the project area, including specific reference to significant communities and species. It is intended to be a practical document that functions as a single point of reference to guide the management of these values.

Sections 6.1 and 6.2 below provide an overview of the management strategy that is to be applied to protect flora and fauna values within the project area during construction. Each section contains a table outlining the key management actions that must be completed. Additional details pertaining to management outcomes, required frequency of the management action, and person/s responsible for implementing the action have also been included to ensure that site staff implementing the plan have a clear indication of the management requirements.

In addition to the management action table, each section also contains a table outlining the monitoring program for each phase. This table outlines the key monitoring requirements associated with each management action and provides a list of corrective

actions to be implemented should monitoring identify any unplanned impacts to flora and fauna. It has been organised based on the frequency of each monitoring task so that site staff implementing the plan can readily schedule the necessary monitoring actions.

Each section also contains a table that addresses how the management actions apply to species and communities listed as threatened under Queensland and Commonwealth legislation. This table provides a direct cross reference to the management actions that will be implemented to protect each significant value and has been designed to assist both the regulators and site staff in understanding how threatened species and communities will be protected during construction and operation.

6.1 CONSTRUCTION PHASE OF THE PROJECT

During the construction phase of the project, BMA will implement a tiered approach to managing potential impacts on vegetation communities and threatened flora and fauna. The following section outlines the general environmental management actions that will be implemented, and provides specific mitigation and management measures to reduce potential impacts to levels that will not cause permanent harm to significant species or community.

All works during the construction phase will be undertaken in accordance with the project Environmental Management Plan (Construction) (EMP(C)). The EMP(C) will include a range of measures aimed at reducing ongoing impacts to environmental values that are associated with the construction of the road realignment. The management strategy contained within this document will be used to inform the development of this plan.

6.1.1 MANAGEMENT ACTIONS

Table 5 provides an overview of the management actions that will be implemented during the construction phase of the project. These actions have been developed across three themes - general environment, vegetation and fauna - to ensure that environmental management on site is commensurate with the protection of ecological values within the project area.

6.1.1.1 Commonwealth Threatened Species and Communities

Table 7 provides a summary of those management strategies identified in Table 5 that will be used to facilitate the management of ecological communities and species listed under the EPBC Act that have either been recorded on site, or have the potential to occur. Implementation of these strategies will ensure that impacts to these species are avoided or minimised and will not be of such a degree as to result on a significant impact on any MNES associated with the project area.

6.1.1.2 Queensland Threatened Species and Communities

Table 8 summarises the management actions (from Table 5) that apply to each species listed as significant under the NC Act that has been identified as occurring, or likely to occur, in the project area. Implementation of these strategies will ensure that impacts to these species are avoided or minimised to the greatest extent possible.

6.1.1 MONITORING REQUIREMENTS

Table 6 provides an overview of the monitoring requirements that will be implemented to assess the effectiveness of the management strategies implemented during the

construction phase. Corrective measures have been provided to address any issues or non-conformances that are recorded during monitoring. Where the corrective actions listed do not resolve the issue, an adaptive management strategy must be implemented to ensure that the issue is rectified and that flora and fauna values are not adversely impacted.

All monitoring will be undertaken in accordance with the project Environmental Management Plan (Construction) and the DTMR Technical Standard MTRS51 Environmental Management.

Table 5: Management Actions - Construction Phase

Action Number	Management Action	Management Objective	Management Frequency	Person Responsible
1.0 General Environmental Management				
1.1	Implement dust suppression measures, including: • Watering of haul roads and stockpiles • Providing at least one water tanker per earthworks/roadworks area • Reduction of vehicle speed limits to 40km/h	• Minimise dust levels • Reduce stress on fauna species resulting from airborne dust	Ongoing throughout construction phase	Site Supervisor
1.2	Implement erosion and sediment control measures including: • Clearly demarcate disturbance areas adjoining threatened vegetation communities (e.g. the area in which the corridor has been narrowed to 26.6m) prior to the commencement of works • Installing sediment control fencing • Exclude all non-essential construction activities and infrastructure (e.g. laydown areas, stockpiles, storage areas, site offices etc) from within 50m of watercourses, where possible • Minimising the area of disturbance to limit erosion potential • Construct sediment management devices to minimise sedimentation and runoff from construction areas	• Minimise the impacts of erosion and sedimentation, particularly within 50 metres of the high bank of the watercourse on site	Prior to commencement of works Ongoing throughout construction phase	Site Supervisor
1.3	Minimise potential light and noise pollution by: • Restricting construction activities to reasonable daylight hours and minimise night work • Installing directional lighting, where lighting is required	• Reduce impacts of light pollution on fauna	Ongoing throughout construction phase	Site Supervisor
1.4	Minimise potential bushfire risk during construction by: • Implementing a fire hazard and management protocol for the site • Prohibiting spark and flame activities on high fire danger days • Installing all necessary fire fighting equipment at appropriate locations on site • Creating a site layout that facilitates safe and efficient access for emergency vehicles • Establishing setbacks between areas of retained vegetation and activities that could result in an increased fire risk (e.g. fuel storage, refuelling areas, live spark and flame areas etc)	• Minimise additional bushfire hazard risk associated with the construction phase	Prior to commencement of works Ongoing throughout construction phase	Site Supervisor
2.0 Vegetation Management				
2.1	Limit the area of disturbance to only those areas absolutely necessary: • Undertaking all vegetation clearing in accordance with approved vegetation clearing permits • Installing appropriate barricading or signage to delineate between areas to be cleared and areas to be retained • Preventing encroachment of construction works into Of Concern and Endangered Regional Ecosystems and/or Threatened Ecological Communities • Employing a strategic system for clearing and grubbing (e.g. directional and/or staged clearing)	• Minimise impacts to vegetation to be retained • No unplanned vegetation clearing resulting from construction techniques or activities	Prior to commencement of works Ongoing throughout construction phase	Site Supervisor
2.2	Undertake a vegetation pre-clearing survey during optimal survey times to: • Identify, mark and map the distribution of environmentally sensitive areas • Undertake an optimal season survey identify any presence of King Blue-grass and Finger Panic Grass within suitable habitat of the disturbance area. Where these species are recorded in, or adjoining, disturbance areas the following procedures are to be implemented: o Notify the Site Supervisor immediately o Provide the results of the survey to DEHP and SEWPaC and obtain relevant clearing approvals where necessary o Update the Species Management Plan and the project Offset Plan if necessary	• No unplanned impacts to State and/or Federally significant vegetation communities and species • To ensure that the results of the pre-clearing vegetation surveys are incorporated into updated versions of the SMP and the project Offset Plan, where necessary	Prior to commencement of works	Environmental Officer/Qualified Ecologist

Action Number	Management Action	Management Objective	Management Frequency	Person Responsible
	o Ensure that the proposed offset areas provide similar potential habitat for any additional offsets required for the species			
2.3	Implement weed management strategies including: • Avoiding dispersal of weed species from both internal and external sources by implementing control measures, including ensuring all earthmoving equipment is cleaned (i.e. free of contaminants) and has a valid weed certification prior to entering the subject site, confirming imported topsoil material is weed free etc • Managing declared weed species and other environmental weeds known to detrimentally impact upon significant flora (e.g. Parthenium, Parkinsonia, Rhodes Grass, Liverseed Grass, Prickly Acacia and Buffel Grass) • Ensuring all removed weeds, weed-affected materials and rubbish are appropriately disposed of off-site	• Avoid increases in weed occurrence associated with the construction phase • Minimise adverse effects of weed infestations on biodiversity	Ongoing throughout construction phase	Site Supervisor Environmental Officer
3.0 Fauna Management				
3.1	Engage qualified and experienced fauna spotter/catcher to conduct pre-clearance fauna inspections of the project area within 24 hours prior to disturbance	• No unplanned impacts to fauna utilising the project area	Prior to the commencement of works	Fauna Spotter/Catcher
3.2	Protect fauna from construction activities by: • Using directionally appropriate clearing to allow fauna to disperse into areas of adjoining habitat • Sequentially clearing vegetation in discrete stages to provide fauna sufficient time and space to disperse from the clearing area of their own volition • Implementing measures to minimise potential mortality on internal and external roads, including ensuring that construction personnel adhere to speed limits and are aware of the likelihood of potential fauna encounters • Locating construction infrastructure greater than 4m in height away from suitable reptile habitat to reduce predation opportunities for birds of prey	• Avoid mortality of fauna during construction • Minimise risk of injury to fauna during construction	Ongoing throughout construction phase	Site Supervisor Environmental Officer
3.3	Protect fauna habitat from construction by: • Fencing and signing areas of retained fauna habitat • Ensuring that no impacts occur outside the approved road corridor, and where possible limiting disturbance within the corridor to only those areas that are necessary to facilitate construction • Identifying locations outside the road corridor for the relocation of captured fauna and retained hollow sections of trees in adjoining or proximate habitat areas prior to clearing	• Avoid impacts to fauna habitat features to be retained • Avoid unplanned impacts to threatened fauna species or their breeding habitat	Ongoing throughout construction phase	Site Supervisor Environmental Officer
3.4	Ensure that all culverts located in Ornamental Snake habitat areas are of a design that will facilitate reptile movements. As outlined in Appendix C the following culverts are located with Ornamental Snake habitat and conform to the required design specifications: • Winchester Creek: 8 x 3.6m x 2.1m box culvert • Ripplestone Creek: 6 x 2.4m x 2.1m box culvert • South of rail crossing A: 2 x 1.5m diameter pipe culvert • South of rail crossing B: 2 x 1.5m x 0.9m box culvert The locations of these culverts are shown in Figures 4a-d.	• Facilitate reptile movement throughout the project area	During project design and ongoing throughout construction phase	Project Manager Site Supervisor
3.5	Implement a clearing procedure for HBTs, including: • Clearing all vegetation around HBTs prior to their removal	• Avoid mortality of hollow-dependent fauna during vegetation clearing • Avoid impacts to HBT habitat features to be	Ongoing throughout vegetation clearing	Site Supervisor

Action Number	Management Action	Management Objective	Management Frequency	Person Responsible
	• Tapping HBTs following clearing of surrounding vegetation and leaving them to stand for 24 hours • Smoothly felling HBT to minimise damage to hollows • Inspecting hollows of felled HBTs (by fauna spotter/catcher) and removing and relocating any fauna found • Leaving the tree on the ground for a minimum of two hours to provide any trapped fauna with an opportunity to escape. Where possible leave fallen trees overnight	retained and relocated		Fauna Spotter/Catcher
3.6	Implement pest animal management strategies for feral cats and red foxes based on the BMA Peak Downs Mine Pest Management Procedure (Document number PDM-PRO-0001, Version 3.A, 23 January 2013) including: • Conducting a surveillance and control needs assessment of the project site prior to implementing pest management measures to identify feral species numbers and ideal baiting/trapping sites. • Instigating a controlled 1080 baiting and cat trapping program, based on the results of the needs assessment, using a qualified and licensed contractor • Laying baits/traps in the late afternoon, as cats and foxes are mostly active between dusk and dawn. This strategy will also reduce the incidence of non-target fauna accessing the baits/traps • Partially burying meat baits to prevent the bait from being readily moved • Conducting the control program based on the needs assessment, with pest animal management to occur at least annually • Ensuring that the animal control program complies with the legislative and legal requirement to minimise animal pain and suffering, regardless of the status given to a particular pest species or the extent of damage or impact created by that pest • Coordinating the control program with pest management activities being undertaken within the adjoining Peak Downs Mine site Reference will be made to the BMA Peak Downs Mine Pest Management Procedure for further specific details relating to the control program to be implemented, including activities, requirements and safety considerations etc.	• Avoid increases in the incidence of pest animals during the construction phase • Minimise impacts of pest animals on biodiversity	Ongoing throughout construction phase	Site Supervisor Environmental Officer
3.7	Ensure site personnel and offices are adequately prepared to manage fauna encounters during clearing by: • Keeping fauna handling equipment (e.g. gloves, bags, snake hooks etc) in the site office for emergency use by staff • Employing a qualified and licensed fauna spotter/catcher to be present during clearing of vegetation with high ecological value • Ensuring fauna spotter/catchers carry a fauna rescue kit in their site vehicle • Ensuring spotter/catchers provide all specialised equipment required for their task and hold the necessary approvals and licences for animal handling during pre-clearance surveys or clearing activities • Maintaining current contact details for spotter/catchers, wildlife carers and veterinary clinics in site offices and with the Environmental Officer and Site Supervisor at locations where clearing is taking place • Confirming with local clinics or rescue organisations prior to commencing clearing that they will accept any animals injured on site	• Avoid mortality of fauna during construction • Minimise risk of injury to fauna during construction	Ongoing throughout vegetation clearing	Site Supervisor Fauna Spotter/Catcher
3.8	Implement a fauna handling procedure where fauna (including injured, shocked or juvenile animals or eggs) are encountered during vegetation clearing in the project area, including: • If fauna require handling, this will be done with care and by the fauna specialist and the Environmental Officer will record the incident on the incident register for inclusion in routine	• Minimise disturbance, injury and mortality to fauna through sensitive fauna handling procedures	Ongoing throughout vegetation clearing	Environmental Officer

Action Number	Management Action	Management Objective	Management Frequency	Person Responsible
	monthly reporting on the project • For larger animals, cover the animal with a towel or a blanket to minimise stress and firmly but gently place it in a cardboard box, or natural fibre bag • For small animals, place in a cotton bag, tied at the top • Keep the animal in a quiet, warm, ventilated and dark place. A designated site for the release of fauna would be decided upon in advance of any construction work • Record GPS coordinates of the original and translocation sites for fauna relocated into adjoining or proximate habitat to be incorporated into routine reporting to DEHP • If the animal is seriously injured and requires immediate attention, as determined by the fauna specialist, a local wildlife carer/veterinarian will be contacted immediately and the animal shall be transported to a native animal hospital/refuge or veterinarian by appropriate/qualified persons • If a fauna specialist is not present when an injured/juvenile animal is found, a local wildlife carer/veterinarian will be contacted immediately to recover the animal and transport it to a native animal hospital/refuge or veterinarian • Some animals require particular handling (e.g. venomous reptiles, raptors) and should not be handled by unqualified site personnel • If the animal cannot be handled, record the exact location of the animal and exclude construction from the locality until it has vacated the area of its own volition			Fauna Spotter/Catcher
3.9	Implement a fauna release procedure for uninjured fauna relocated into nearby habitat, including: • Spotter/catchers or ecologists will be responsible for undertaking any release • Release should be into similar habitat as close to the original area as possible • If the species is nocturnal, release will be carried out at dusk • No release will take place during periods of heavy rainfall, extreme heat or cold, unless the fauna specialist determines that the animal is too stressed to be held any longer	• Avoid adverse impacts to relocated fauna	Ongoing throughout vegetation clearing	Environmental Officer Fauna Spotter/Catcher

Table 6: Monitoring Requirements - Construction Phase

Monitoring Frequency	Management Action	Monitoring Requirement	Corrective Action	Person Responsible
Daily	1.1 Implement dust suppression measures	• Assess dust deposition on retained trees, shrubs and groundcover • Monitor implementation of watering procedures for unsealed road sections and stockpiles • Monitor compliance with vehicle speed limits	• Where dust deposition is observed to be substantially different to non-work areas, and impacts to vegetation are expected, dust is to be removed from vegetation • Increase surface watering for dust suppression where necessary • Monitor weather forecasts to predict watering needs ahead of windy or dry days • Stabilise/cover all materials that will be stockpiled for longer than 1 month by grassing, erosion blanketing, emulsion spray or another approved method • Implement measures to improve compliance with vehicle speed limits, including installing signage and/or traffic calming devices and undertaking disciplinary measures for personnel in breach of speed limits, including cautions, removal of driving privileges and change of personnel	Site Supervisor
	1.2 Implement erosion and sediment control measures	• Inspect erosion and sediment control devices to ensure they are fully operational	• Re-mark or reinstate clearing area delineation fencing where it has failed • Reinstate sediment fencing where it has failed • Clean out erosion and sediment control devices when they have reached 80% capacity and ensure that all material is removed correctly and in accordance with the waste management specifications within the site EMP(C).	Site Supervisor
	1.3 Minimise potential light and noise pollution	• Monitor construction hours to ensure that they are not unnecessarily extending beyond daylight hours	• Where impacts to fauna roosting and/or breeding are suspected or observed, implement management strategies including revised night time construction hours, directional lighting and use of low noise machinery in affected areas to minimise further disturbance	Site Supervisor
	2.1 Limit the area of disturbance to only those areas absolutely necessary	• Inspect extent of works to ensure there is no encroachment into areas of retained vegetation • Inspect demarcation barriers to ensure that they are in an operable condition • Monitor vegetation disposal to ensure that no debris has been pushed into gullies, watercourses or drainage lines	• Reinstate demarcation barriers where they are damaged or have failed • Revegetate areas in which construction has encroached into retained vegetation outside of the approved road corridor • Notify DNRM/SEWPaC if construction activities have encroached within Endangered Regional Ecosystems and/or Threatened Ecological Communities located outside of the approved road corridor. Immediately rehabilitate areas of retained vegetation where construction has encroached • Reinforce the need to use designated pathways during site toolbox meetings	Site Supervisor
	3.2 Protect fauna from construction activities	• Monitor vegetation clearing activities to ensure that they are being undertaken in an approved directional and sequential manner • Check suitability of site fencing • Monitor compliance with vehicle speed limits • Checks of holes, trenches or ditches in the active construction area each morning prior to works commencing for trapped or residing individuals	• Reinforce vegetation clearing direction and sequencing during site toolbox meetings • Reiterate vehicle speed limits during site toolbox meetings and undertake disciplinary action for any site staff repeatedly exceeding the established limits • If a fauna species is observed during vegetation clearing do not continue clearing in this location until the animal has vacated the area of its own volition. If it does not move, the Environmental Officer or the fauna spotter/catcher is to remove and relocate the individual prior to the recommencement of works	Site Supervisor
	3.3 Protect fauna	• Monitor demarcation barriers to ensure they are in an operable	• Reinstate or replace damaged or inoperable demarcation barriers	Site Supervisor

Monitoring Frequency	Management Action	Monitoring Requirement	Corrective Action	Person Responsible
	habitat from construction	condition • Monitor areas of retained vegetation and buffer areas to ensure there is no encroachment into these areas	• Immediately rehabilitate buffers or areas of retained vegetation where construction has encroached • Reiterate the location of buffers and areas of vegetation to be retained during site toolbox meetings	
Monthly	1.2 Implement erosion and sediment control measures	• Monitor water quality of receiving environments to ensure no adverse impacts on ecological values	• Place construction activities adjoining waterways on hold until the source of water quality exceedances is identified • Rectify existing erosion and sediment control measures, where they have failed • Implement new erosion and sediment control measures for areas of new/unplanned erosion	Environmental Officer
	2.4 Implement weed management strategies	• Confirm that all vehicles hold a valid weed certificate • Confirm that all imported topsoil has been certified as weed free • Monitor the extent of existing and new weed infestations within the project area • Monitor the effectiveness of weed control programs on weed infestations	• Prevent access to the site of all vehicles that have not been certified as being weed free • Reiterate the importance of driving only on designated tracks during toolbox meetings • Implement a weed control program for any new declared weed species recorded in the project area during the construction period	Environmental Officer
	3.7 Ensure site personnel and offices are adequately prepared to manage fauna encounters during clearing	• Routinely check that site staff, contractors and site offices possess correct equipment and information	• Ensure correct equipment is sourced prior to commencement or continuation of works • Update relevant office-based materials regularly to ensure they remain current	Environmental Officer Fauna Spotter/Catcher
As required	1.2 Implement erosion and sediment control measures	• Monitor soil erosion following heavy rainfall events	• Rectify existing erosion and sediment control measures, where they have failed • Implement new erosion and sediment control measures for areas of new/unplanned erosion	Site Supervisor
	1.4 Minimise potential bushfire risk during construction	• Monitor site activities on days of high fire danger to ensure that high risk activities are not undertaken	• Incorporate a briefing on potential site-based fire hazards at toolbox meetings on high fire danger days • Immediately cease all activities that create an unacceptable bushfire risk	Site Supervisor
	3.5 Implement a clearing procedure for HBTs	• Monitor clearing of HBTs to ensure that habitat features to be retained are not damaged	• Reiterate the correct procedure for clearing HBTs at toolbox meetings and ensure that only experienced operators undertake this task • Where fauna is unintentionally injured or killed during HBT removal, place works in the affected area on hold and immediately engage a spotter/catcher to recover the individual (refer to Actions 3.8 and 3.9 for correct procedures)	Site Supervisor Fauna Spotter/Catcher
	3.6 Implement pest animal management	• Monitor for the presence of, and increases in, pest animal species within the project area	• Implement preventative actions including ensuring that food scraps and other wastes are cleaned up • Provide a briefing on pest animal management at toolbox meetings • Implement pest animal management strategies as required	Site Supervisor Environmental Officer

6.1.2 REPORTING REQUIREMENTS

Implementation of the management plan will include reporting requirements. The key reporting that will be necessary during the construction phase will include preparation of pre-clearance reports and incident reporting. Further detail associated with these reports is provided below.

6.1.2.1 Fauna Pre-Clearance Reports

The fauna spotter/catchers engaged on the project will provide a report to BMA at the completion of vegetation clearing activities containing the following information:

- spotter catcher activities undertaken at each area;
- information on clearing methods, dates, procedures and areas;
- types of habitats removed during clearing, including GPS locations;
- number and quality of habitat trees removed, including GPS locations;
- number and types species of fauna sighted, relocated and/or injured/ killed, including GPS coordinates and photographs of rescued fauna;
- details of animal breeding places encountered in the field;
- number and type of obvious breeding places removed/destroyed during construction;
- number of hollow bearing trees or nests removed or relocated during clearing works, including GPS coordinates and photos of new locations; and
- number of hollow bearing trees removed confirmed as hosting a listed species.

6.1.2.2 Incident Reporting

In the event of injury or death of any fauna species, all incidents will be recorded in an incident register and reported to DEHP as part of routine monthly reporting for the project. Injury or death to any Near Threatened, Vulnerable or Endangered fauna must be reported (via email) within 24 hours.

The details for reporting incidents to DEHP are as follows:

- the coordinates of where the incident occurred will be recorded;
- the checking methods will be outlined i.e. confirmation the pre-clearance surveys were undertaken in accordance with the methodology outlined above;
- confirmation that the spotter/catcher was suitably qualified; and
- suggested mitigation measures to ensure that a similar incident does not occur in the future.

Furthermore, all injuries and deaths of native fauna will be recorded by the spotter/catcher (including species type and GPS location), and provided to the site Environmental Officer

and BMA on completion of the clearing works. These records will be kept by the Environmental Officer and will be made available to DEHP upon request.

6.1.3 EDUCATION AWARENESS AND TRAINING

All site employees will be required to attend general environmental awareness training upon arrival to site which will detail the employee's responsibility for complying with environmental laws, Queensland and Commonwealth regulations, requirements and the BMA policies and standards. In addition, employees will receive ongoing classroom and on-the-job Environmental and Safety Health training for specific job tasks with consideration to specific environmental aspects to be considered during works.

Training sessions will address the importance of environmental awareness in the employee's everyday duties. Environmentally sensitive areas adjacent to the site and work areas, as well as construction exclusion zones, will be identified and discussed. All staff will be provided awareness training on the type of species and communities that occur in the project area. They will also be trained on significant species, including what they look like and where to go to report any sightings. All construction staff will also be advised of the spotter/catcher procedures that will be implemented during the construction phase.

The objective of training sessions regarding ecological communities and flora and fauna values (including threatened species) will be to ensure that all employees are aware of their surroundings and the conservation of the communities and/ or species within the area they are working on.

7 COMMONWEALTH PROTECTED MATTERS

Table 7 provides an overview of the management actions that will be applied to protect Matters of National Environmental Significance known or likely to occur within the project area.

It is intended that this information will be used by SEWPaC to identify the management measures that will be utilised to avoid and mitigate impacts on MNES as a result of the project. During the construction phase, it may also be used as a reference by site personnel to determine what specific actions must be considered when working in proximity to known occurrences of MNES.

Table 7: Management Actions - Commonwealth Threatened Species and Communities

Value	EBPC Act Status	Applicable Management Actions
Ecological Communities		
Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin (as shown on Figures 4a-c)	Endangered	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.4 Minimise potential bushfire risk 2.1 Limit the area of disturbance 2.2 Undertake a vegetation pre-clearing survey 2.3 Implement weed management strategies
Flora		
King Blue-grass (*Dichanthium queenslandicum*)	Endangered	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.4 Minimise potential bushfire risk 2.1 Limit the area of disturbance 2.2 Undertake a vegetation pre-clearing survey during optimal survey times 2.3 Implement weed management strategies
Finger Panic Grass (*Digitaria porrecta*)	Endangered	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.4 Minimise potential bushfire risk 2.1 Limit the area of disturbance 2.2 Undertake a vegetation pre-clearing survey

Value	EBPC Act Status	Applicable Management Actions
		during optimal survey times 2.3 Implement weed management strategies
Reptiles		
Ornamental Snake (*Denisonia maculata*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.4 Ensure all culverts in Ornamental Snake habitat facilitate reptile movement 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Yakka Skink (*Egernia rugosa*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.4 Ensure all culverts in Ornamental Snake habitat facilitate reptile movement 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Dunmall's Snake (*Furnia dunmalli*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance

Value	EBPC Act Status	Applicable Management Actions
		2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.4 Ensure all culverts in Ornamental Snake habitat facilitate reptile movement 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Allan's Lerista (*Lerista allanae*)	Endangered	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.4 Ensure all culverts in Ornamental Snake habitat facilitate reptile movement 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Birds		
Squatter Pigeon (*Geophaps scripta scripta*)	Vulnerable	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities

Value	EBPC Act Status	Applicable Management Actions
		3.3 Protect fauna habitat from construction 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Mammals		
South-eastern Long-eared Bat (*Nyctophilus corbeni*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.5 Implement a clearing procedure for HBTs 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Koala (*Phascolarctos cinereus*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure

8 STATE PROTECTED MATTERS

Table 8 provides an overview of the management actions that will be applied to protect State significant ecological values known or likely to occur within the project area.

It is intended that this information will be used by DEHP to identify the management measures that will be utilised to avoid and mitigate impacts on threatened flora and fauna as a result of the project. During the construction phase, it may also be used as a reference by site personnel to determine what specific actions must be considered when working in proximity to known occurrences of significant species.

Table 8: Management Actions - State Threatened Species

Value	NC Act Status	Applicable Management Actions
Flora		
Finger Panic Grass (*Digitaria porrecta*)	Near Threatened	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.4 Minimise potential bushfire risk 2.1 Limit the area of disturbance 2.2 Undertake a vegetation pre-clearing survey during optimal survey times 2.3 Implement weed management strategies
Desmodium macrocarpum	Near Threatened	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.4 Minimise potential bushfire risk 2.1 Limit the area of disturbance 2.2 Undertake a vegetation pre-clearing survey 2.3 Implement weed management strategies
Black Orchid (*Cymbidium canaliculatum)*	Type A Restricted Plant	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.4 Minimise potential bushfire risk 2.1 Limit the area of disturbance 2.2 Undertake a vegetation pre-clearing survey 2.3 Implement weed management strategies

Value	NC Act Status	Applicable Management Actions
Reptiles		
Ornamental Snake (*Denisonia maculata*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.4 Ensure all culverts in Ornamental Snake habitat facilitate reptile movement 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Yakka Skink (*Egernia rugosa*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.4 Ensure all culverts in Ornamental Snake habitat facilitate reptile movement 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Dunmall's Snake (*Furnia dunmalli*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys

Value	NC Act Status	Applicable Management Actions
		3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.4 Ensure all culverts in Ornamental Snake habitat facilitate reptile movement 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Allan's Lerista (*Lerista allanae*)	Endangered	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.4 Ensure all culverts in Ornamental Snake habitat facilitate reptile movement 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Birds		
Black-necked Stork (*Ephippiorhynchus asiaticus)*	Near Threatened	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.6 Implement pest animal management

Value	NC Act Status	Applicable Management Actions
		3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Squatter Pigeon (*Geophaps scripta scripta*)	Vulnerable	1.1 Implement dust suppression measures 1.2 Implement erosion and sediment control measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 2.3 Implement weed management strategies 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Mammals		
Little Pied Bat (*Chalinolobus pictatus*)	Near Threatened	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.5 Implement a clearing procedure for HBTs 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
South-eastern Long-eared Bat (*Nyctophilus corbeni*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance

Value	NC Act Status	Applicable Management Actions
		3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.5 Implement a clearing procedure for HBTs 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure
Koala (*Phascolarctos cinereus*)	Vulnerable	1.1 Implement dust suppression measures 1.3 Minimise potential light and noise pollution 2.1 Limit the area of disturbance 3.1 Conduct pre-clearance fauna surveys 3.2 Protect fauna from construction activities 3.3 Protect fauna habitat from construction 3.6 Implement pest animal management 3.7 Ensure preparedness for fauna encounters 3.8 Implement a fauna handling procedure 3.9 Implement a fauna release procedure

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APPENDIX A – THREATENED SPECIES AND COMMUNITIES DESCRIPTIONS

COMMONWEALTH THREATENED SPECIES AND COMMUNITIES

Value	EBPC Act Status	Description
Ecological Communities		
Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin	Endangered	The Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy (Natural Grasslands TEC) Basin occurs within the Queensland Brigalow Belt which stretches from Rockhampton in Queensland to the border of NSW. The region encompasses much of the country that receives 500 to 750 mm of rainfall per year. Community composition is predominantly forbs and native grasses dominated by *Dichanthium spp*. (bluegrasses), *Aristida spp*. and *Panicum spp*., and containing other species such as *Austrostipa spp*. (spear grasses), *Austrodanthonia spp*. (wallaby grasses) and *Astrebla spp*. (Mitchell grasses).
Flora		
King Blue-grass (*Dichanthium queenslandicum*)	Endangered	King blue-grass is endemic to central and southern Queensland where it occurs in three disjunct populations: 1) Hughenden district (one record); 2) from Nebo to Monto and west to Clermont and Rolleston; and 3) Dalby district, Darling Downs. It occurs on black cracking clay in tussock grasslands mainly in association with other species of blue grasses (*Dichanthium* spp. and *Bothriochloa* spp.) but also with other grasses restricted to this soil type. The distribution of the species overlaps with the following EPBC Act listed communities: Brigalow; Weeping Myall Woodlands; Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and southern Queensland; and Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin.
Finger Panic Grass (*Digitaria porrecta*)	Near Threatened	*Digitaria porrecta* occurs in Queensland and New South Wales. Within Queensland it is located in Nebo, the Central Highlands, and from Jandowae south to Warwick. It is typically found in woodland and open forests associated with basalt plains; however it has also been observed in disturbed habitats such as grazed paddocks. It is often located in communities dominated by *Eucalyptus orgadophila* on hills and slopes and *E. tereticornis* and *E. populnea* in drainage lines. It is also associated with a number of groundcovers, including *Dichanthium sericeum*, *Panicum decompositum*, *Digitaria divaricatissima*, *Aristida leptopoda*, *Boerhavia dominii*, *Mentha satureioides*, *Psoralea tenax*, *Rhynchosia minima*, *Panicum queenslandicum*, *Paspalidium globoideum*, *Themeda avenacea*,

Value	EBPC Act Status	Description
		Ixiolaena brevicompta, *Sclerolaena muricata* and *Tribulus micrococcus*.
Reptiles		
Ornamental Snake (*Denisonia maculata*)	Vulnerable	The Ornamental Snake's preferred habitat is within, or close to, habitat that is favored by its prey - frogs. The species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland Regional Ecosystem Land Zone 4, but also lake margins and wetlands. Gilgai formations are found where deep-cracking alluvial soils with high clay contents occur.
Yakka Skink (*Egernia rugosa*)	Vulnerable	Occurs in open dry sclerophyll forest, woodland and scrub within the Mulga Lands and Brigalow Belt South Bioregion. Common woodland types include: *Acacia harpophylla*, *A. aneura*, *A. catenulata*, *A. shirleyi*, *Casuarina cristata*, *E. populnea*, *Eucalyptus* spp., *Callitris glaucophylla*. Microhabitat requirements include areas for the species to shelter including partly buried rocks, logs or tree stumps, root cavities, abandoned animal burrows and sometimes dense ground cover. 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.
Dunmall's Snake (*Furnia dunmalli*)	Vulnerable	Habitat includes forests and woodlands on black alluvial cracking clay and clay loams dominated by *Acacia harpophylla, A. burowii, A. deanii, A. leiocalyx, Callitris* spp. or *Allocasuarina luehmannii*. Also found in *Corymbia citriodora, Eucalyptus crebra* and *E. melanophloia, Callitris glaucophylla* and *Allocasuarina luehmannii* open forest and woodland associations on sandstone derived soils. The species has been found sheltering under fallen timber and ground litter.
Allan's Lerista (*Lerista allanae*)	Endangered	*Lerista allanae* is restricted to the Brigalow Belt Northern Region in eastern central Queensland in populations that have been fragmented by vegetation clearing. Habitat for the species occurs in association with black soil downs, which are undulating plans formed on basalt, shale, sandstone and unconsolidated sediments. It is currently known to occur in association with Regional Ecosystems 11.8.5 and RE 11.8.11, and is found under leaf

Value	EBPC Act Status	Description
		litter and in friable soils beneath trees and shrubs.
Birds		
Squatter Pigeon (*Geophaps scripta scripta*)	Vulnerable	The Squatter Pigeon occurs mainly in grassy woodlands and open forests that are dominated by eucalypts. It has also been recorded in sown grasslands with scattered remnant trees, disturbed habitats (i.e. around stockyards, along roads and railways, and around settlements), in scrub and Acacia regrowth, and remains common in heavily-grazed country north of the Tropic of Capricorn. The species is commonly observed in habitats that are located close to bodies of water.
Mammals		
South-eastern Long-eared Bat (*Nyctophilus corbeni*)	Vulnerable	Limited distribution around the Murray-Darling Basin in south-eastern Australia. This species occurs in a range of inland woodland vegetation types, but is most common in box, ironbark and cypress pine woodlands. Has been recorded in semi-green vine thicket with *Brachychiton* sp. emergent, inland dry sclerophyll forest, open forest with grass trees, Callitris forest, mixed Eucalyptus, Poplar box forest and open forest with mid-storey Allocasuarina and Callitris.
Koala (*Phascolarctos cinereus*)	Vulnerable	Common throughout the broad band of forests and woodlands dominated by Eucalyptus spp. extending from north Queensland to the south-eastern corner of mainland South Australia. Occupy forests and woodlands where there are acceptable food trees (*Eucalyptus* spp., *Corymbia* spp., etc.). Distribution is affected by altitude, temperature and leaf moisture.

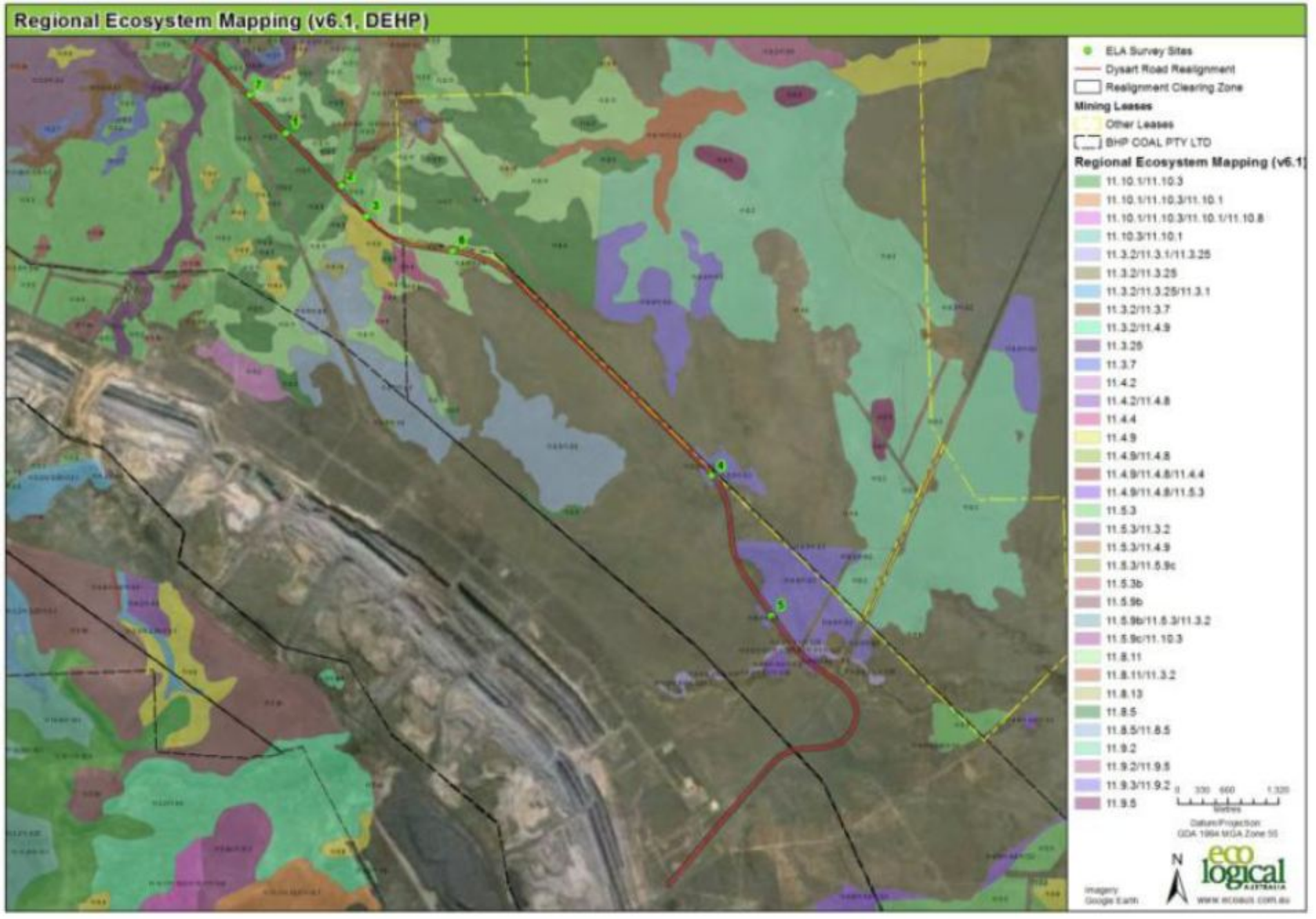
STATE THREATENED SPECIES

Value	NC Act Status	Description
Flora		
Finger Panic Grass (*Digitaria porrecta*)	Near Threatened	*Digitaria porrecta* occurs in Queensland and New South Wales. Within Queensland it is located in Nebo, the Central Highlands, and from Jandowae south to Warwick. It is typically found in woodland and open forests associated with basalt plains; however it has also been observed in disturbed habitats such as grazed paddocks. It is often located in communities dominated by *Eucalyptus orgadophila* on hills and slopes and *E. tereticornis* and *E. populnea* in drainage lines. It is also associated with a number of groundcovers, including *Dichanthium sericeum*, *Panicum decompositum*, *Digitaria divaricatissima*, *Aristida leptopoda*, *Boerhavia dominii*, *Mentha satureioides*, *Psoralea tenax*, *Rhynchosia minima*, *Panicum queenslandicum*, *Paspalidium globoideum*, *Themeda avenacea*, *Ixiolaena brevicompta*, *Sclerolaena muricata* and *Tribulus micrococcus*.
Desmodium macrocarpum	Near Threatened	*Desmodium macrocarpum* occurs in north-east Queensland and central Queensland in open Eucalypt forest, vine thicket and Eucalypt woodland at altitudes between 190-900m.
Black Orchid (*Cymbidium canaliculatum)*	Type A Restricted Plant	*Cymbidium canaliculatum* has a scattered distribution in northern and eastern Australia occurring in north-east New South Wales, Queensland, Northern Territory and Western Australia. It is known to occur in dry sclerophyll forests and woodlands, growing in tree hollows.
Reptiles		
Ornamental Snake (*Denisonia maculata*)	Vulnerable	The Ornamental Snake's preferred habitat is within, or close to, habitat that is favored by its prey - frogs. The species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland Regional Ecosystem Land Zone 4, but also lake margins and wetlands. Gilgai formations are found where deep-cracking alluvial soils with high clay contents occur.
Yakka Skink	Vulnerable	Occurs in open dry sclerophyll forest, woodland and scrub within the Mulga Lands and

Value	NC Act Status	Description
(*Egernia rugosa*)		Brigalow Belt South Bioregion. Common woodland types include: *Acacia harpophylla*, *A. aneura*, *A. catenulata*, *A. shirleyi*, *Casuarina cristata*, *E. populnea*, *Eucalyptus* spp., *Callitris glaucophylla*. Microhabitat requirements include areas for the species to shelter including partly buried rocks, logs or tree stumps, root cavities, abandoned animal burrows and sometimes dense ground cover. 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.
Dunmall's Snake (*Furnia dunmalli*)	Vulnerable	Habitat includes forests and woodlands on black alluvial cracking clay and clay loams dominated by *Acacia harpophylla, A. burowii, A. deanii, A. leiocalyx, Callitris* spp. or *Allocasuarina luehmannii*. Also found in *Corymbia citriodora, Eucalyptus crebra* and *E. melanophloia, Callitris glaucophylla* and *Allocasuarina luehmannii* open forest and woodland associations on sandstone derived soils. The species has been found sheltering under fallen timber and ground litter.
Allan's Lerista (*Lerista allanae*)	Endangered	*Lerista allanae* is restricted to the Brigalow Belt Northern Region in eastern central Queensland in populations that have been fragmented by vegetation clearing. Habitat for the species occurs in association with black soil downs, which are undulating plans formed on basalt, shale, sandstone and unconsolidated sediments. It is currently known to occur in association with Regional Ecosystems 11.8.5 and RE 11.8.11, and is found under leaf litter and in friable soils beneath trees and shrubs.
Birds		
Black-necked Stork (*Ephippiorhynchus asiaticus)*	Near Threatened	Inhabits wetlands, such as floodplains of rivers with large shallow swamps and pools, and deeper permanent bodies of water. The Black-necked Stork is widely distributed in northern Australia, and also sparsely distributed in coastal eastern Australia from Queensland to southern New South Wales. This species forages in wetlands, mangroves, swamps, mudflats, dry floodplains, irrigated land and occasionally open grassy woodland.
Squatter Pigeon (*Geophaps scripta scripta*)	Vulnerable	The Squatter Pigeon occurs mainly in grassy woodlands and open forests that are dominated by eucalypts. It has also been recorded in sown grasslands with scattered remnant trees, disturbed habitats (i.e. around stockyards, along roads and railways, and

Value	NC Act Status	Description
		around settlements), in scrub and Acacia regrowth, and remains common in heavily-grazed country north of the Tropic of Capricorn. The species is commonly observed in habitats that are located close to bodies of water.
Mammals		
Little Pied Bat (*Chalinolobus pictatus*)	Near Threatened	*Chalinolobus pictatus* occurs from the Greenvale region to Maryborough in Queensland, and within western New South Wales and north-eastern South Australia. Within Queensland the species' distribution extends through semi-arid, central and south-west Queensland, and also in some areas east of the Great Dividing Range. It occurs in dry forest and open woodland communities and in the Brigalow Belt region is found in association with Brigalow/Belah communities, semi-evergreen vine thicket, Poplar Box woodland and *Callitris*/*Allocasuarina* dominated forests with emergent eucalypts. Roosting habitat for the species includes tree hollows, caves, abandoned mines and buildings.
South-eastern Long-eared Bat (*Nyctophilus corbeni*)	Vulnerable	Limited distribution around the Murray-Darling Basin in south-eastern Australia. This species occurs in a range of inland woodland vegetation types, but is most common in box, ironbark and cypress pine woodlands. Has been recorded in semi-green vine thicket with *Brachychiton* sp. emergent, inland dry sclerophyll forest, open forest with grass trees, *Callitris* forest, mixed *Eucalyptus*, Poplar Box forest and open forest with mid-storey *Allocasuarina* and *Callitris*.
Koala (*Phascolarctos cinereus*)	Vulnerable	Common throughout the broad band of forests and woodlands dominated by *Eucalyptus* spp. extending from north Queensland to the south-eastern corner of mainland South Australia. Occupy forests and woodlands where there are acceptable food trees (*Eucalyptus* spp., *Corymbia* spp., etc.). Distribution is affected by altitude, temperature and leaf moisture.

APPENDIX B – THREATENED SPECIES AND COMMUNITIES POTENTIAL HABITAT AREAS


Regional Ecosystem Mapping (v6.1, DEHP)
ELA Survey Sites
Dysart Road Realignment
Realignment Clearing Zone
Mining Leases
Other Leases
BHP COAL PTY LTD
Regional Ecosystem Mapping (v6.1)
11.10.1/11.10.3
11.10.1/11.10.3/11.10.1
11.10.1/11.10.3/11.10.1/11.10.8
11.10.3/11.10.1
11.3.2/11.3.1/11.3.25
11.3.2/11.3.25
11.3.2/11.3.25/11.3.1
11.3.2/11.3.7
11.3.2/11.4.9
11.3.25
11.3.7
11.4.2
11.4.2/11.4.8
11.4.4
11.4.9
11.4.9/11.4.8
11.4.9/11.4.8/11.4.4
11.4.9/11.4.8/11.5.3
11.5.3
11.5.3/11.3.2
11.5.3/11.4.9
11.5.3/11.5.9c
11.5.3b
11.5.9b
11.5.9b/11.5.3/11.3.2
11.5.9c/11.10.3
11.8.11
11.8.11/11.3.2
11.8.13
11.8.5
11.8.5/11.8.5
11.9.2
11.9.2/11.9.5
11.9.3/11.9.2
11.9.5
0 330 660 1,320
Metres
Datum/Projection:
GDA 1994 MGA Zone 55
Imagery
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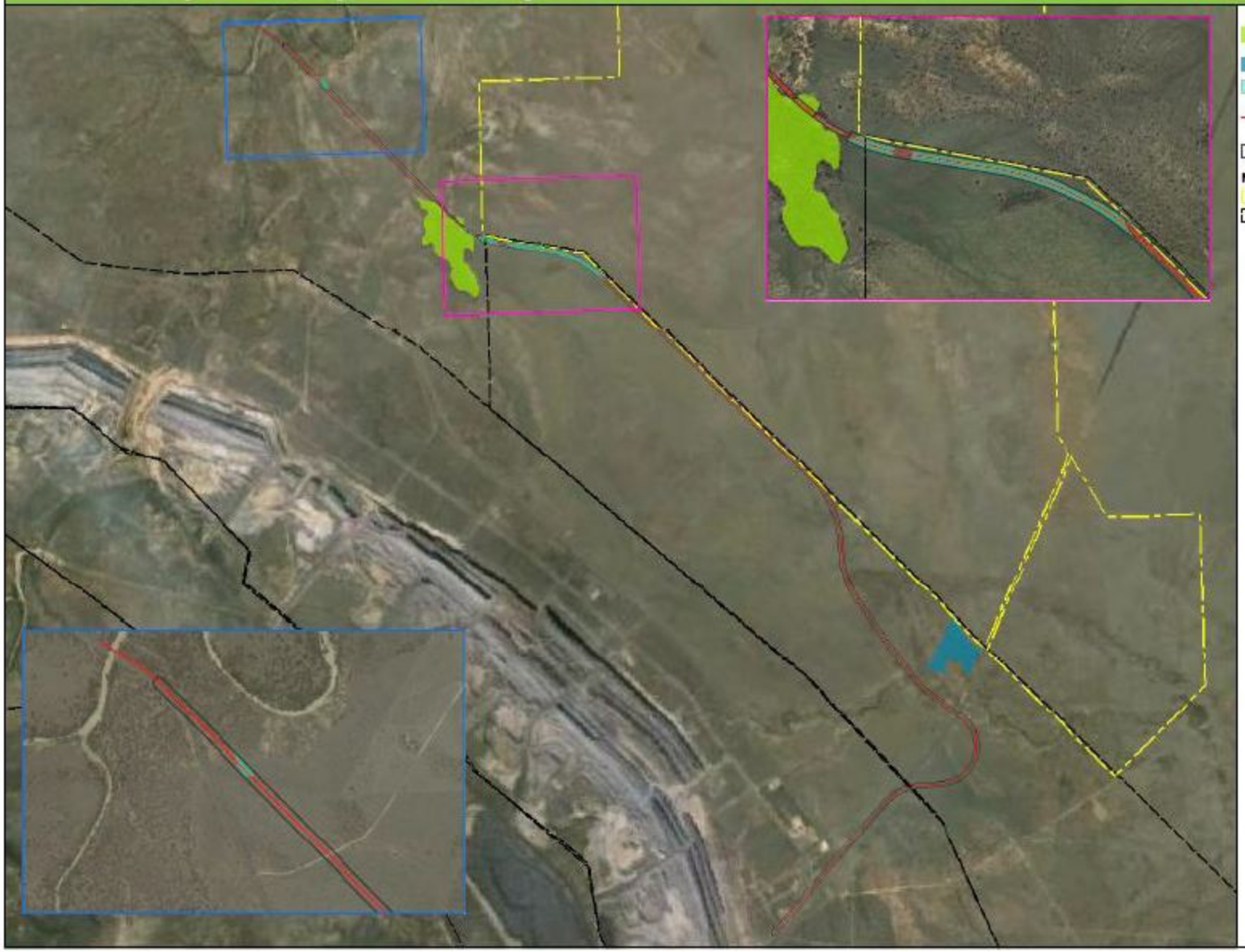
TEC within or adjacent to the Dysart Road Realingment



Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin

ELA Survey Sites
Natural Grasslands TEC - 10.2 ha
Dysart Road Realignment
Realignment Clearing Zone

Mining Leases

Other Leases
BHP COAL PTY LTD

0 100 200 700
Meters

Datum/Projection
GDA 1994 MGA Zone 55

Limitations
Locations of flora and fauna have been recorded with a hand-held GPS unit(s) which have an accuracy of approx. 20m

Data Sources
Bing Aerials
Google Earth

N

ecological AUSTRALIA
www.ecoaus.com.au

Potential Finger Panic Grass Habitat

ELA Survey Sites
Potential Finger Panic Grass Habitat
Dysart Road Realignment
Realignment Clearing Zone
Mining Leases
Other Leases
BHP COAL PTY LTD

0 195 390 784
Meters

Datum/Projection
GDA 1994 MGA Zone 55

N

ecological
www.ecoaus.com.au

LOCATIONS
Locations of flora and fauna have been recorded with a handheld GPS unit(s) which have an accuracy of approx. 20m

Data Sources
Bing Aerials
Google Earth

Potential King Blue-grass Habitat

ELA Survey Sites
Potential King Blue-grass Habitat
Dysart Road Realignment
Realignment Clearing Zone

Mining Leases

Other Leases
BHP COAL PTY LTD

0 195 390 780
Meters

Datum/Projection
GDA 1994 MGA Zone 55

Limitations
Locations of flora and fauna have been recorded with a hand-held GPS unit(s), which have an accuracy of approx. 20m

Data Sources
Bing Aerials
Google Earth

N

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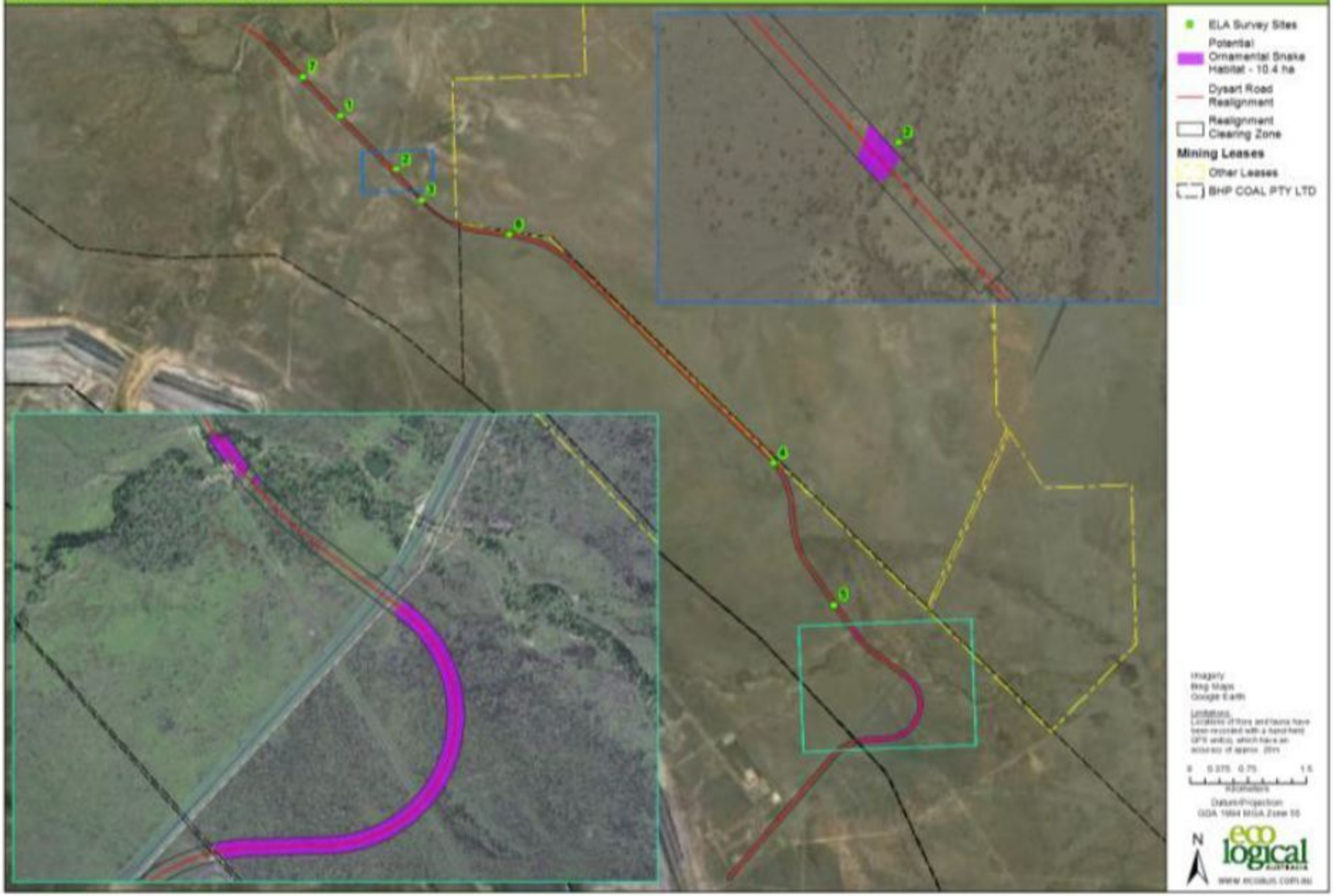
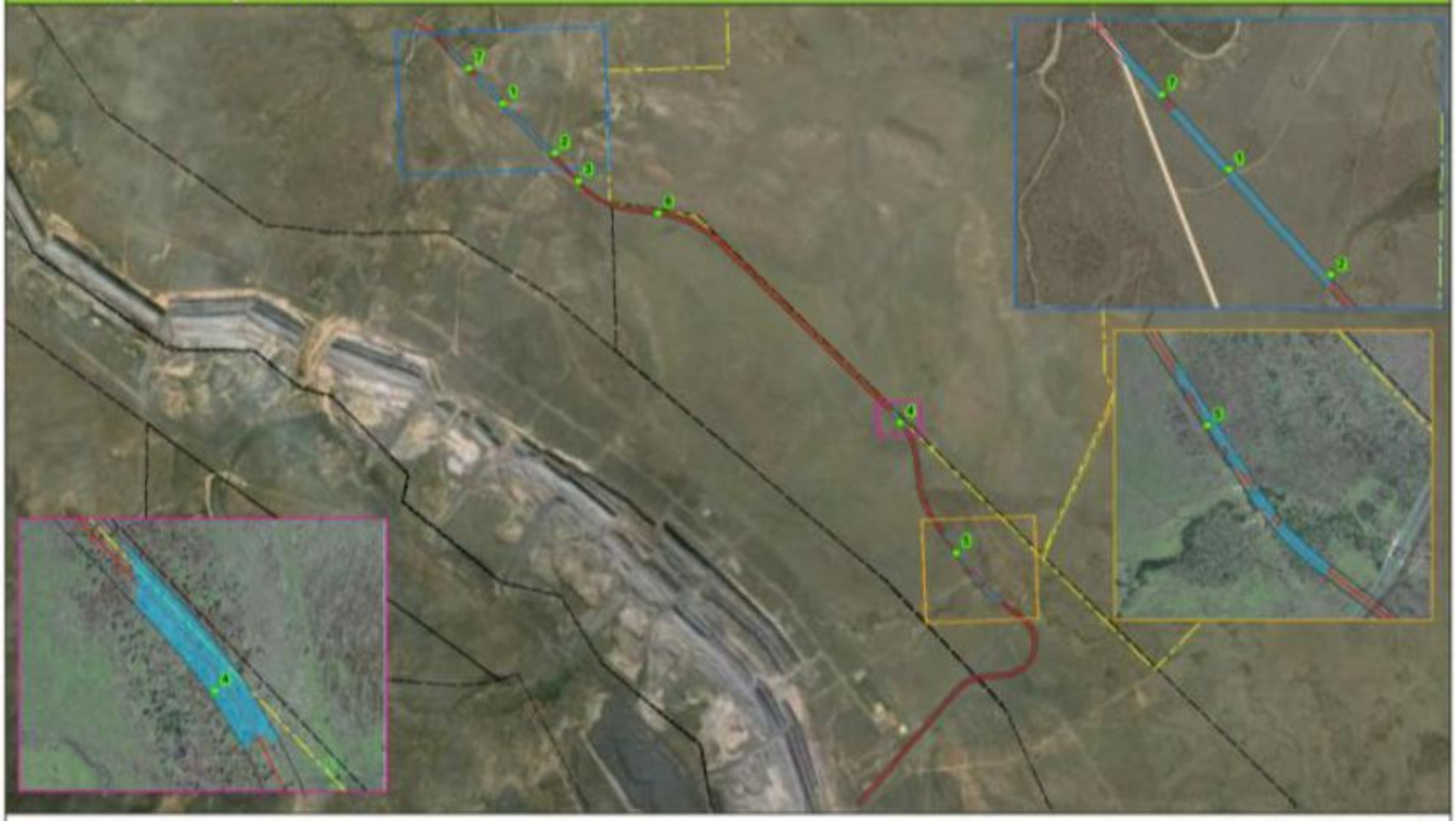
www.ecoaus.com.au

Potential Ornamental Snake Habitat



Potential Squatter Pigeon Habitat



ELA Survey Sites
Potential Squatter Pigeon Habitat
Dysart Road Realignment
Realignment Clearing Zone

Mining Leases

Other Leases
BHP COAL PTY LTD

0 700 1,400 2,800
Metres

Datum/Projection:
GDA 1994 MGA Zone 55

Data Sources:
Bing Aerials
Google Earth

N

eco logical australia
www.ecoaus.com.au

Potential Southern Long-eared Bat Habitat

ELA Survey Sites
Potential Southern Long-eared Bat Habitat
Dysart Road Realignment
Realignment Clearing Zone

Mining Leases

Other Leases
BHP COAL PTY LTD

0 500 1,000 2,000
Meters

Datum/Projection
GDA 1994 MGA Zone 55

Limitations
Locations of flora and fauna have been recorded with a hand-held GPS unit(s), which have an accuracy of approx. 20m.

Data Sources:
Bing Aerials
Google Earth

N

eco logical AUSTRALIA
www.ecoaus.com.au

Potential Koala Habitat

APPENDIX C – RATIONALE FOR CULVERT DESIGNS TO FACILITATE REPTILE MOVEMENTS

The EPBC Act Approval Decision for the Dysart Road realignment contains a condition that the Species Management Plan (SMP) provide for:

> *"All culverts proposed to occur within Ornamental Snake habitat, as shown in Annexure 3, must be of a design to facilitate reptiles entering and passing through culverts and the rationale for the design must be provided."*

The design for the Dysart road realignment includes four culverts within Ornamental Snake habitat. The specifications of the culverts to be used at these four locations are:

- Winchester Creek: 8 x 3.6m x 2.1m box culvert
- Ripplestone Creek: 6 x 2.4m x 2.1m box culvert
- South of rail crossing A: 2 x 1.5m diameter pipe culvert
- South of rail crossing B: 2 x 1.5m x 0.9m box culvert

The location of these culverts within Ornamental Snake habitat is shown on Figures 4a, 4c and 4d.

Based on Government guidelines and published literature it has been established that each of these culvert designs have been demonstrated to facilitate reptile movements at varying road locations around Australia. The information supporting this includes:

Queensland Department of Transport and Main Roads (2010) Road Drainage Manual 2nd Edition.

Chapter 7 of this guide to the planning, design, operation and maintenance of Road Drainage infrastructure specifically deals with the environmental considerations of design.

The manual provides information on confirmed culvert designs that have been shown in practical experience around Australia to allow fauna movements to occur. This includes reptiles, namely snakes and lizards.

Reproduced below is the table from the manual with confirmed culvert sizes and the fauna types that are known to move through each culvert type. For reptiles all culvert sizes and underpasses have been confirmed. The culverts to be used in the Dysart Road realignment all fit within one of these confirmed categories as follows:

Large box culvert <1.2m high	Winchester Creek: 8 x 3.6m x 2.1m box culvert Ripplestone Creek: 6 x 2.4m x 2.1m box culvert
Small box culvert >1.2m high	South of rail crossing B: 2 x 1.5m x 0.9m box culvert
Large pipe >0.5m dia	South of rail crossing A: 2 x 1.5m diameter pipe culvert

(*Reproduced) Table 7.6.5 - Confirmed Use of Culverts or Underpass Types by Fauna*

Fauna Type	**Small Pipe <0.5m dia**	**Large Pipe >0.5m dia**	**Small Box Culvert >1.2m high**[1]	**Large Box Culvert <1.2m high**	**Bridge Underpass**
Small mammal	√	√	√	√	√
Medium mammal	×	√	×	√	√
Large mammal	×	×	×	√	√
Semi-arboreal mammal	×	×	×	√	√
Arboreal mammal	×	×	×	×	√ (large only)
Bats	×	×	×	√ (adapted roof structure)	√ (adapted roof structure)
Reptile	√	√	√	√	√
Bird	×	×	×	√	√
Amphibian	√	×	√	√	√
Introduced predator	√	√	√	√	√

Source: Queensland Department of Main Roads, 2000.

Caution: This table is based on preliminary research only. Although not confirmed at the time, fauna should pass through all the culverts larger than the minimum ones shown. Recommended minimum sizes for design are shown in Section 4.2.2.3 of this Manual

[1] *NB. This table heading contains a typographical error correction from the original that was incorrectly printed as <12.m.*

The information and sources used to inform the Queensland Department of Transport and Main Roads Road Drainage Manual includes a report produced in 2000 titled:

Department of Transport and Main Roads (2000) Fauna Sensitive Road Design Manual Technical Document Volumes 1 and 2

This manual cites a number of studies throughout Australia that have monitored and researched the use of road culverts by fauna. A number of these studies include data on the use of varying sized culverts by reptiles. This information has been used to inform the DTMR Road Drainage Manual and subsequently the Dysart Rd realignment design. References for a selection of the relevant studies are provided below:

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