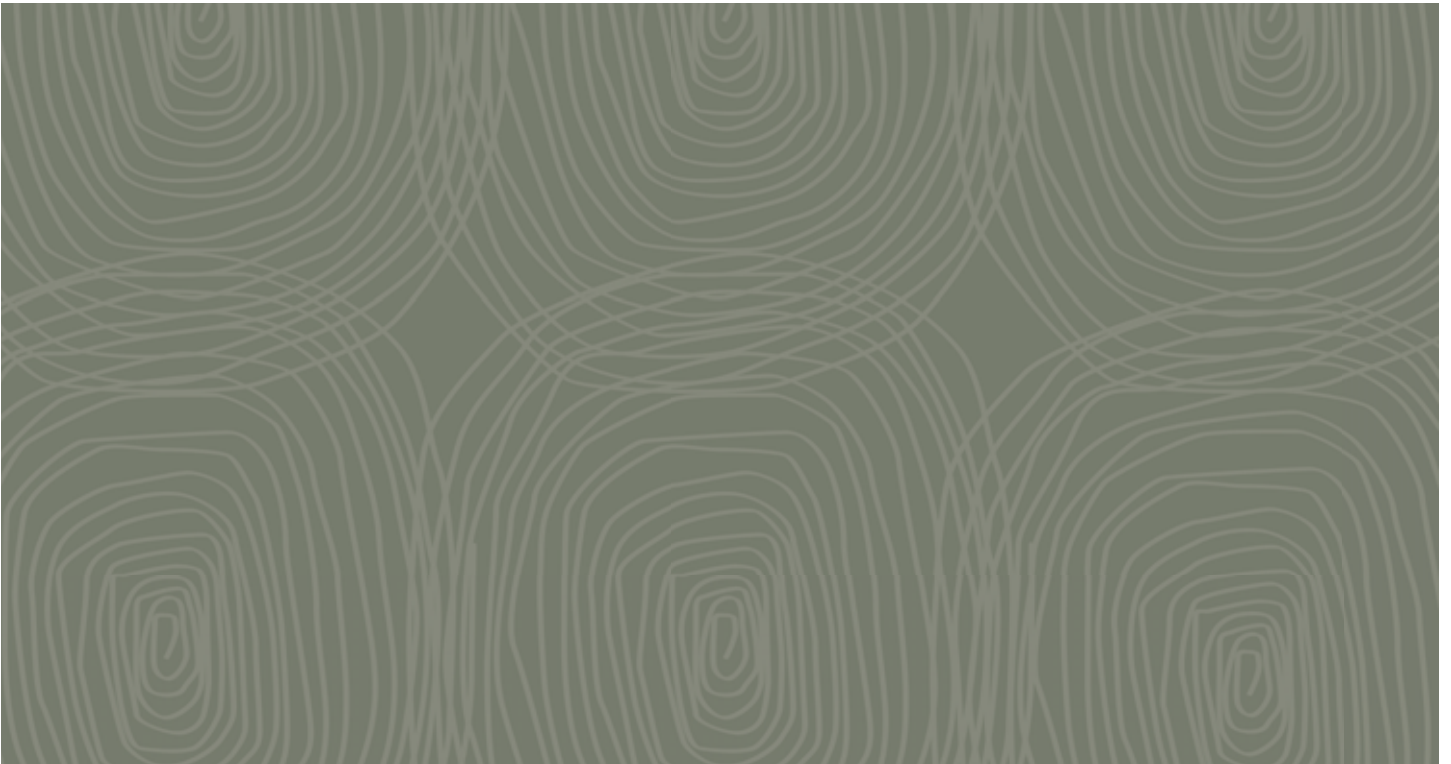


09 | Terrestrial Ecology





Section 09 Terrestrial Ecology

9.1 Introduction

This section of the Environmental Impact Statement (EIS) describes the existing environmental values identified on-site in terms of the terrestrial flora and fauna for the Kevin's Corner Mine Project (the Project). The potential impacts that the proposed mining activities may have upon these ecological values are assessed and any mitigation measures that may be required are outlined.

9.2 Sensitive Environmental Areas

9.2.1 Description of Environmental Values

The Project site is located in the south-eastern corner of the Desert Uplands bioregion in Central Queensland, approximately 340 kilometres (km) south-west of Mackay and 110 km west south-west of Clermont. Much of the site is situated upon relatively productive alluvial plains within the otherwise infertile Desert Uplands region. These areas have been historically subjected to high grazing pressures and widespread clearing for pasture development. In addition, many of the vegetation communities represented on site have naturally restricted distributions, resulting in a high degree of communities being endemic to the area (Sattler and Williams, 1999).

A review of the Queensland Department of Environment and Resource Management (DERM) Environmentally Sensitive Areas (ESA) mapping for the Project site revealed the existence of a protected area, the Cudmore Resources Reserve, within the north eastern section of the site. Resources Reserves are protected and managed under the *Nature Conservation Act 1992* (NC Act) to protect and provide for the controlled use of cultural and natural resources and ensure that the area is maintained predominantly in its natural condition (Part 4, Schedule 21 of the NC Act). The Cudmore Resources Reserve has been under the joint trusteeship of the Queensland Department of Mines and Energy (now the Department of Employment, Economic Development and Innovation - DEEDI) and Queensland National Parks and Wildlife Service (NPWS) since 1999. The DERM map of ESAs is provided below in Figure 9-1.

The Project site may provide important landscape linkages between ESAs such as the Cudmore Resources Reserve and surrounding habitats. Habitat connectivity involves the linkages of habitats, species, communities and ecological processes. The smaller and more isolated habitat patches will have fewer species than large patches. Wildlife corridors are systems of linear habitat which, at a minimum, enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation. Corridors can support ecological processes at a variety of spatial and temporal scales from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions.

9.2.1.1 EPBC listed communities

A vegetation community discovered within the proposed transport corridors to the east of the site is listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) as an Endangered Ecological Community. The Bluegrass Grassland (RE 11.8.11) is included within the EPBC listed Natural grasslands of the Queensland central highlands and the northern Fitzroy basin



ecological community. This community has been listed as Endangered due to a severe decrease in area and condition (64% decline in area since European settlement and over 60% of remaining vegetation in a degraded state), as well as its small geographic distribution, ongoing threats, and the loss or decline of species important to its ongoing integrity (Threatened Species Scientific Committee, 2008). This RE will subsequently be referred to as the title given under the EPBC Act.

RE 11.3.2 has been determined by the DERM RE mapping to occur within the transport corridor and is included within the Poplar Box Open Woodland and is listed as 'Of Concern' under the *Vegetation Management Act 1999* (VM Act). Weeping Myall (*Acacia pendula*) is known to be associated with this RE, and targeted searches for this species will need to be conducted to ascertain the presence or absence of Weeping Myall Woodlands, which is listed as an Endangered Ecological Community under the EPBC Act.

An additional three ecological communities listed as Endangered under the EPBC Act have been identified in database searches as potentially inhabiting the Project site. These include Brigalow (*Acacia harpophylla* dominant and co-dominant) woodlands, Semi-evergreen vine thickets of the Brigalow Belt (North and South) and the Nandewar Regions and The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin. The Brigalow woodlands categorised as Endangered under the EPBC Act constitute 16 REs; however, none of these REs occur on the Project site.

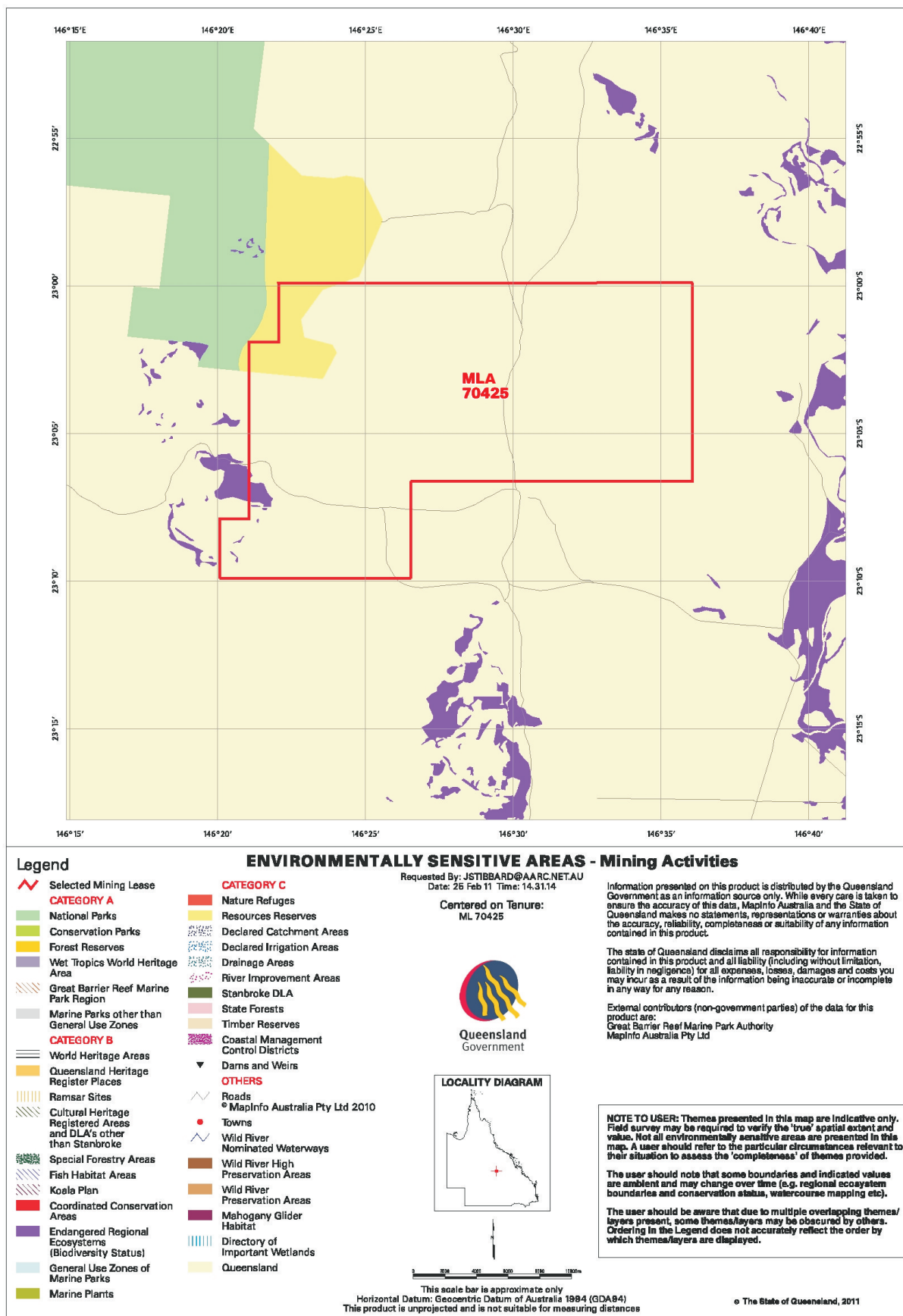
9.2.1.2 DERM listed communities

An ESA was located on site in an area mapped as an Endangered Regional Ecosystem (ERE) under the DERM biodiversity status. Brigalow Open Woodland (RE 10.9.3) is an ERE located in small, disjunct patches in the southwest portion of the site. The reasons behind the listing of this ERE include its rarity for the bioregion (800 ha in total area) and its scattered distribution along with susceptibility to salinity, weed infestation and the risk of extinction from localised events such as tree clearing and fire.

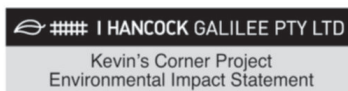
Eight Regional Ecosystems (REs) located on site are listed as Of Concern within DERMs Biodiversity Status. They include REs within the Brigalow Open Woodland (RE 10.4.5 and 11.3.5), the Poplar Box Open Woodland (RE 10.3.27a and RE 11.3.2) and Fringing Riparian Woodland (RE 10.3.13a and 10.3.14). These are described further along with reasons for their listings below.

Environmentally sensitive areas surrounding the Project site include the Cudmore National Park, located approximately 700 metres west of the Project boundary, and a nature refuge on Lot 4 Plan BF 22 located 27 km south of the Project boundary. This nature refuge was established in March 2001. Refer to Figure 9-1 for locations of each ERE area, the resource reserve and national park.

No conservation parks, declared fish habitat areas, wilderness areas, aquatic reserves, heritage or historic areas, national estates, world heritage listings, sites listed by international treaties or agreements, or areas of cultural significance relating to biodiversity were located on the Project site.



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ENVIRONMENTALLY SENSITIVE AREAS

Job Number 4262 6660
Revision B
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Figure: 9-1

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9.2.1.3 Essential Habitat

Essential habitat is an area or location that exhibits essential resources for the maintenance of populations of priority species (which can include threatened and non-threatened species). Essential habitat is considered known where a species is present (based on accurate records) and there are indications of reproduction, or where a significant number of individuals are present, or important resources (such as nest sites, roost caves, major food sources) are present, or where important movement corridors for breeding and/or non-breeding (including migratory) individuals have been identified. Alternatively, essential habitat is considered possible where there exists suitable habitat of a size capable of supporting one or more breeding units and important resources (such as nest sites, roost caves, major food sources) are present, or the area is proximal to populations, or may act as a potentially important corridor.

No essential habitat has been mapped within or adjacent to the Project site. Also, no areas have been identified as important habitat for species listed under the *Nature Conservation Act 1992* (NC Act) or the EPBC Act as presumed extinct, critically endangered, endangered, vulnerable or near threatened.

9.2.1.4 EPBC listed Fauna

Fauna species identified in the EPBC database as potentially inhabiting the Project site include the regent honeyeater (*Anthochaera phrygia*), collared delma (*Delma torquata*), star finch (eastern and southern) (*Neochima ruficauda ruficauda*), brigalow scaly-foot (*Paradelma orientalis*), squatter pigeon (southern) (*Geophaps scripta scripta*) and the Julia Creek dunnart (*Sminthopsis douglasii*).

9.2.1.5 HERBREC

No flora species listed under the EPBC Act or NC Act were identified in the Queensland Herbarium's HERBREC database search for the Project site and adjacent area.

9.2.1.6 Protected areas

No areas within or adjacent to the Project site have been proclaimed or are under consideration for proclamation as protected under the NC Act.

Adjacent areas do not include any State-owned land where commercial, native-forest logging occurs; therefore, salvage harvesting is not a requirement of the Project.

Desktop assessments, which include a literature review and online database searches, supported by field surveys have confirmed that the Project site is an area of high biodiversity, with the scale and range of the habitat types (encompassed within the study area) key contributing factors.

9.2.1.7 Desert Uplands Biodiversity Planning Assessment

The Desert Uplands Biodiversity Planning Assessment (BPA) identifies the areas shown in Figure 9-2 as areas of biodiversity significance at either a State, bioregional, national or International scale. This high status for biodiversity significance is determined by seven different criteria:

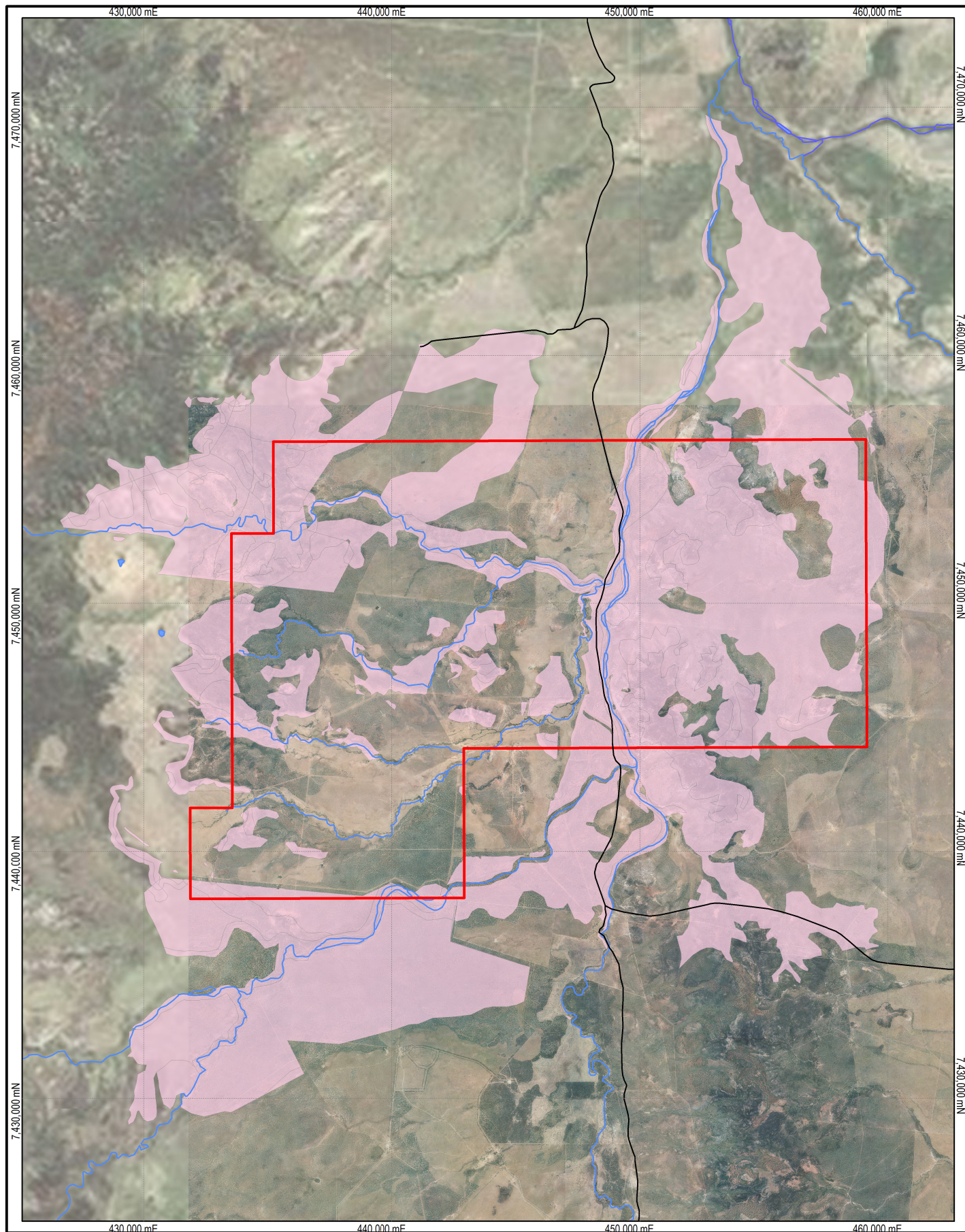
1. Habitat for EVR Taxa – this criterion brings together information on Endangered, Vulnerable and Rare (EVR) taxa using buffering of recorded sites in the absence of Habitat Suitability







Maps (HSM) for species. HSMs are gradually being developed and will progressively replace point records of species.

2. Ecosystem Value – this criterion combines a number of elements including the Biodiversity Status of Regional Ecosystems, the presence of poorly conserved Regional Ecosystems, the presence of significant wetlands, and areas of national importance such as World Heritage Areas and Ramsar Sites.
3. Tract Size – this criterion is a measure of the relative size of tracts of vegetation in the landscape.
4. Relative Size of Regional Ecosystems – this criterion classifies the relative size of each example of a Regional Ecosystem. Patches are compared with all other occurrences of the same Regional Ecosystem.
5. Condition – this criterion represents the quality of remnants judged by the extent to which they resemble their natural condition.
6. Ecosystem Diversity – this criterion reflects the degree to which Regional Ecosystems are packed within an area. That is, an area with high Ecosystem Diversity will have relatively many Regional Ecosystems and ecotones.
7. Context and Connection – this criterion represents the extent to which a Remnant Unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems, and the degree to which a Remnant Unit is connected to other vegetation.

Other supplementary criteria derived from expert and local knowledge regarding essential habitat for EVR taxa, areas with special biodiversity values and important habitat corridors are included to provide an overall scale of the biodiversity significance of each area.



- | | | | |
|---|---|---|----------|
|  | Mining Lease Application
(MLA70425) Boundary |  | Road |
|  | Area of Biodiversity Significance |  | Drainage |

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Scale: 1:200,000 (A4)



AREAS OF BIODIVERSITY SIGNIFICANCE AT THE STATE/BIOREGIONAL OR HIGHER SCALE

Job Number | 4262 6660
Revision | B
Date | 12-09-2011

Figure: 9-2

Datum: GDA94, MGA Zone55

File No: 42626660-g-1061.wor

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9.2.1.8 Wetland areas

The Project lies within the upper Burdekin catchment in the Belyando-Suttor sub-catchment. Watercourses on the site flow only in response to recent, heavy local rain events and dry up quickly following the short wet season. Several waterholes, oxbow lakes and dams provide permanent water throughout the year and are generally associated with the Sandy Creek and Lagoon Creek systems flowing south-north through the Project area. Floodplain wetlands and gilgai (ephemeral depressions in soil that hold water for prolonged periods of time) are present on the site and are generally associated with the Brigalow Woodland community and adjacent non-remnant areas on clay soils. These areas contain significant frog populations and provide important habitat for migratory birds.

The EPBC Act Protected Matter Search Report (13 February 2011) identified no World Heritage Areas nor Wetlands of International (Ramsar) or National Significance within a 10 km radius of the Project site.

The migratory and marine bird species which have been identified during the database search are listed under by the following international agreements / conventions:

- Convention on the Conservation of Migratory Species of Wild Animals (The Bonn Convention);
- Japan – Australia Migratory Bird Agreement (JAMBA);
- China – Australia Migratory Bird Agreement (CAMBA); and
- Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA).

Riparian habitat is in good condition across much of the Project site but grazing pressures have caused bank erosion and siltation in some of the more accessible areas. Most stream beds are comprised of highly permeable coarse sands, however some smaller watercourses upon which Brigalow or Coolabah dominate the tree layer are characterised by less permeable clays where deeper waterholes provide a source of water into the dry season.

9.2.2 Potential Impacts

The five EPBC listed endangered communities potentially occurring on the Project site were not subsequently identified during field surveys. Additionally, no essential habitat for species of conservation significance occurs on or adjacent to the Project site.

Despite the discovery of the ERE 10.9.3 in small pockets to the south-west of the site, its regional integrity should remain intact due to the minimal surface disturbance to this community. However, workings will occur underground that may include some associated surface disturbance and/or lead to issues of land subsidence including modifications to water flows and the water table. The same disturbance exists within the Cudmore Resources Reserve in the north-west of the Project site where similar subterranean mining activities are proposed. These impacts are discussed further within the surface water section of this report (Volume 1, Section 11) but are expected to be minimal given the low degree of projected subsidence. No obligations imposed by the State or Commonwealth Government biodiversity protection legislation apply to the Project.

DERM Biodiversity Action Plans are currently being developed using the Back on Track Species Prioritisation Framework results. The Queensland Brigalow Belt Reptile Recovery Plan developed by DERM in 2008 and the National Recovery Plan for the Black-throated finch southern subspecies



(*Poephila cincta cincta*) developed by New South Wales (NSW) and Queensland governments provide information on threats, recovery objectives and recovery criteria for certain fauna species listed under the EPBC Act as potentially inhabiting the Project site. The extensive searching and trapping that was conducted in habitat favourable for EPBC listed species did not return any positive identifications, leading to the conclusion that the probability of an EPBC threatened species actually inhabiting the Project site is relatively low. This is largely a result of the high degree of site modification through land clearing activities for grazing purposes, leading to weed invasions and loss of suitable habitat for native fauna.

9.3 Terrestrial Flora

This section provides extracts based upon the desktop assessment and field work conducted for the Project. The Flora and Fauna Assessment (2011) is presented in Volume 2, Appendix L1 whilst extracts from the flora assessment are presented thereafter.

9.3.1 Description of Environmental Values

9.3.1.1 Methodology

The terrestrial flora assessment was conducted over the course of nine surveys in order to capture seasonal variations in flora assemblages on the Project site. These surveys were conducted between June 2008 and November 2010. Prior to the field survey, aerial photography was examined to gain an overall perspective of the vegetation distribution and landform variation. Existing RE maps were also reviewed where available.

A vehicle was used to assist the terrestrial flora survey and ensure that the sampling of representative vegetation types and fauna habitats was maximised. This approach also facilitated the targeting of habitats potentially occupied/utilised by species of conservation significance. In contrast, all areas of potential sensitivity (for example, creek lines) were surveyed on foot.

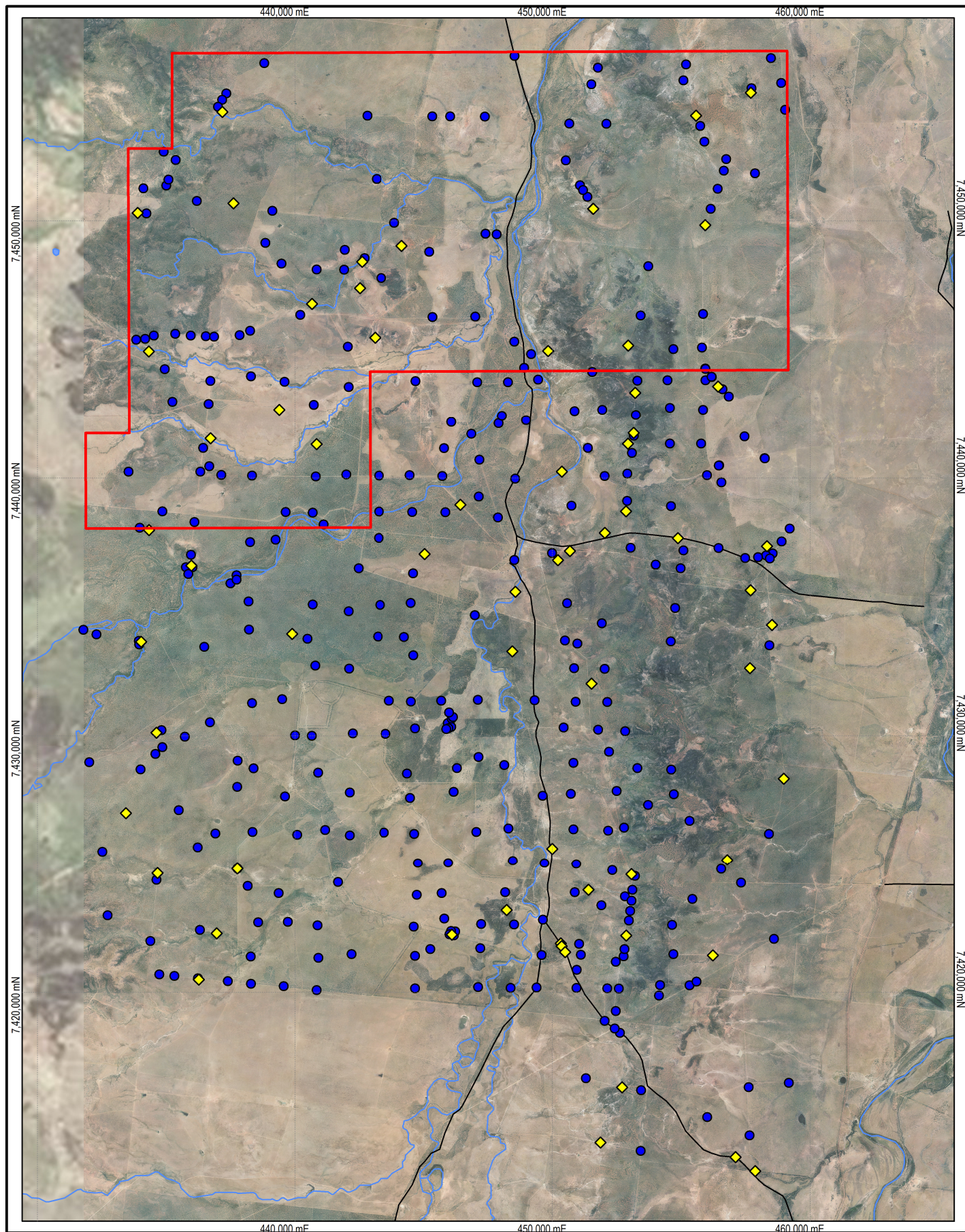
The field survey involved a baseline study site using standard floristic survey methods, in accordance with the Queensland Herbarium Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.1) (Neldner et al., 2005) and the draft NSW Guidelines for Threatened Biodiversity and Assessment (2004). Surveying methods are consistent with the Queensland Herbariums CORVEG database. Vegetation transects were conducted in each vegetation community, in order to obtain a detailed floristic inventory of the dominant and associated woody plants. This methodology allows for three levels of sampling, representing an increasing level of data collection. The quality of each vegetation community was assessed in terms of their likely value and viability as a representative vegetation type. The boundaries of each vegetation community were identified, in order to produce a vegetation community map

Flora transects were surveyed in each of the communities that had been identified within the Project site. The locations of these transects are shown in Figure 9-3. In addition to transects surveyed, incidental observations of flora species were recorded together with notes on their associated vegetation community. Areas of disturbance such as roadsides, dams and creek crossings were also investigated for a number of different species, particularly invasive weeds.

When habitat suitable for a species of conservation significance was located, a specific survey of that species was undertaken. This survey was consistent with the NSW Threatened Species Survey and



Assessment Guidelines (NSW National Parks and Wildlife Service [NPWS], 2001); given such survey guidelines are currently unavailable in Queensland. The method that was used in this survey was the random meander technique. If there was any uncertainty in identifying a particular species, a species specimen was collected and submitted to the Queensland Herbarium for confirmation of its classification.



- Mining Lease Application (MLA70425) Boundary
- ◆ Secondary Transect
- Quaternary Transect
- Road
- Drainage

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Scale: 1:200,000 (A4)



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Kevin's Corner Project
Environmental Impact Statement

SECONDARY AND QUATERNARY VEGETATION TRANSECTS ON AND ADJACENT TO THE PROJECT SITE

Job Number | 4262 6660
Revision | B
Date | 12-09-2011

Figure: 9-3

Datum: GDA94, MGA Zone55
File No: 42626660-g-1062.wor

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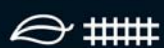
9.3.1.2 Results and Discussion

Twenty-five distinct vegetation communities were identified on the Project site. The location and extent of each vegetation community are presented in Figure 9-4. Twenty four of these communities were classed as Remnant Vegetation as defined in the *Vegetation Management Act 1999* (VM Act). One vegetation communities is listed as Endangered under the EPBC Act Natural Grasslands of the Central Highlands and the northern Fitzroy Basin (RE 11.8.11), whilst another RE is Endangered (RE 10.9.3) and eight others are Of Concern within DERMs Biodiversity Status. A total of 458 flora species were identified within and adjacent to the Project site. None of the flora species identified is listed under Commonwealth or State legislation as species of conservation significance. No plants of commercial, horticultural or cultural significance were identified.

The 25 distinct vegetation communities that were identified on the Project site are listed in Table 9-1 along with their conservation status and total area on site.

Table 9-1 Regional Ecosystem (RE), conservation status and total area of each vegetation community found on-site

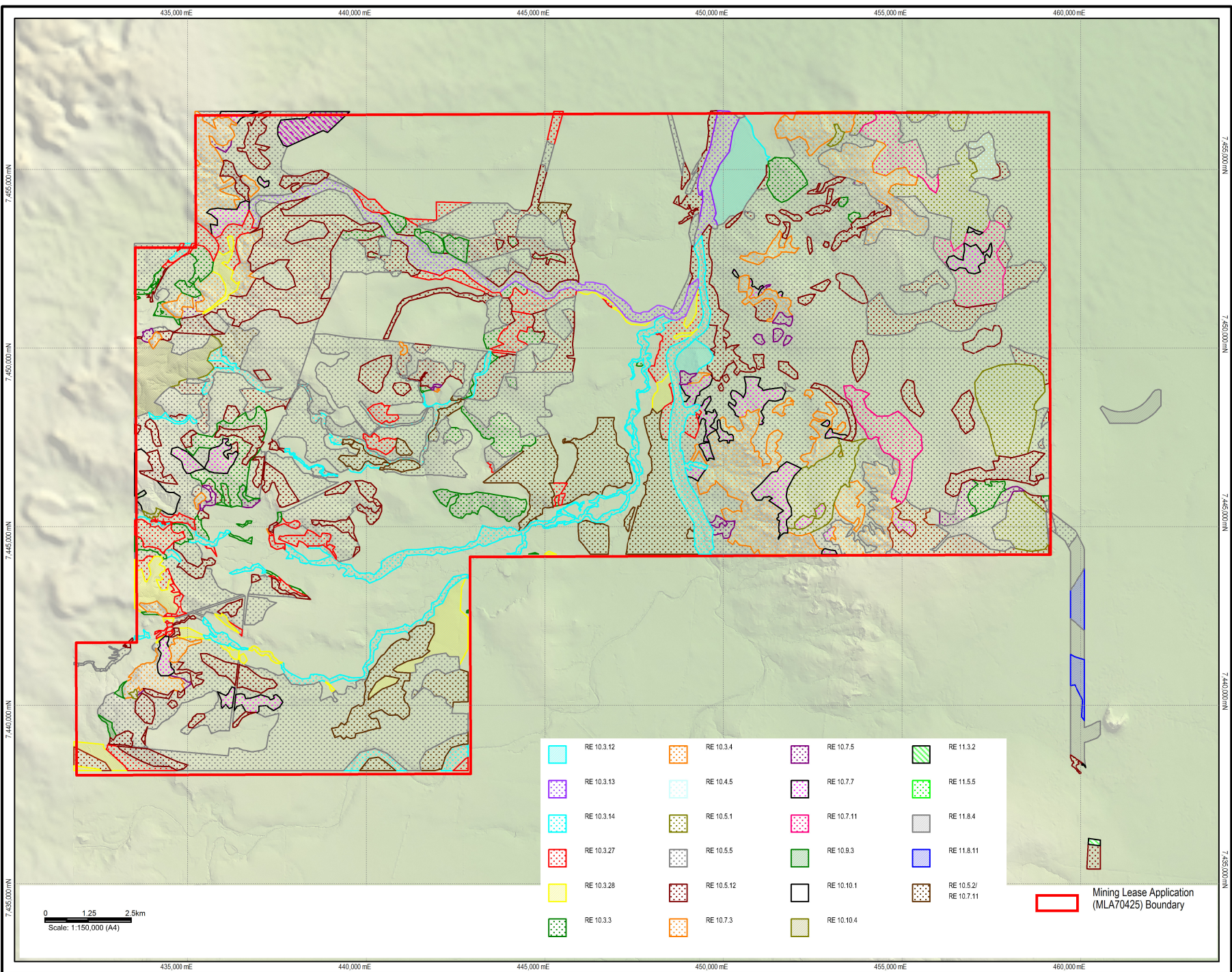
Community Number	Description	Regional Ecosystem	Conservation Status		Area on site (ha)	Location
			EPBC Act (1999)	DERM Biodiversity Status		
1	Brigalow Open Woodland	10.3.3a	Not Listed	No Concern at Present	1,036	ML70425
2	Brigalow Open Woodland	10.4.5	Not Listed	Of Concern	71.1	ML70425
3	Brigalow Open Woodland	10.9.3	Not Listed	Endangered	16.7	ML70425
4	Brigalow Open Woodland	11.3.5	Not Listed	Of Concern	34.4	Road or rail corridor
5	Silver-leaved Ironbark Open Woodland	10.3.28a	Not Listed	No Concern at Present	559.3	ML70425
6	Silver-leaved Ironbark Open Woodland	10.5.5a	Not Listed	No Concern at Present	11,870	ML70425
7	Silver-leaved Ironbark Open Woodland	10.7.11a	Not Listed	No Concern at Present	692.5	ML70425



Community Number	Description	Regional Ecosystem	Conservation Status		Area on site (ha)	Location
			EPBC Act (1999)	DERM Biodiversity Status		
8	Silver-leaved Ironbark Open Woodland	11.8.4	Not Listed	No Concern at Present	197.7	Road or rail corridor
9.	Poplar Box Open Woodland	10.3.27a	Not Listed	Of Concern	894.6	ML70425
10.	Poplar Box Open Woodland	10.5.12	Not Listed	No Concern at Present	4,072	ML70425 Road or rail corridor
11.	Poplar Box Open Woodland	11.3.2	Not Listed	Of Concern	20.1	Road or rail corridor
12.	Poplar Ironbark Mixed Woodland	10.5.5a/10.5.12	Not Listed	No Concern at Present	1,763	ML70425 Road or rail corridor
13.	White Cypress Pine Woodland	11.5.5b	Not Listed	No Concern at Present	3	ML70425 Road or rail corridor
14.	Gidgee Open Woodland	10.3.4	Not Listed	Of Concern	1	ML70425
15.	Fringing Riparian Woodland	10.3.12a	Not Listed	No Concern at Present	341.8	ML70425
16.	Fringing Riparian Woodland	10.3.13a	Not Listed	Of Concern	575.4	ML70425
17.	Fringing Riparian Woodland	10.3.14	Not Listed	Of Concern	1,099	ML70425
18.	Weeping Bottlebrush Heath	10.7.7	Not Listed	No Concern at Present	704.3	ML70425
19.	Thozet's Box Open Woodland	10.7.5	Not Listed	Of Concern	228.6	ML70425



Community Number	Description	Regional Ecosystem	Conservation Status		Area on site (ha)	Location
			EPBC Act (1999)	DERM Biodiversity Status		
20.	Lancewood Woodland	10.7.3b	Not Listed	No Concern at Present	2,168	ML70425
21.	Lancewood Woodland	10.10.1b	Not Listed	No Concern at Present	115.9	ML70425
22.	Queensland Yellowjacket Low Woodland	10.5.1c	Not Listed	No Concern at Present	1,235	ML70425
23.	Rustyjacket Woodland	10.10.4	Not Listed	Least Concern	296.6	ML70425
24.	Natural Grasslands of the Central Highlands and the northern Fitzroy Basin	11.8.11	Endangered	Of Concern	169.7	Road or rail corridor
25.	Non-remnant Grassland	Not classed	Not Listed	Not Listed	10,200	ML70425



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VEGETATION COMMUNITIES ON
THE PROJECT SITE AND
ASSOCIATED TRANSPORT
CORRIDORS

Job Number | 4262 6660
Revision | B
Date | 12-09-2011
Figure: 9-4

File No: 42626660-g-1063.wor

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Community 1 – Brigalow Open Woodland (RE 10.3.3a)

The Brigalow Open Woodland (RE 10.3.3a) occurs along alluvial plains adjacent to larger creek lines, as well as occasional smaller drainage lines. Surface disturbance within this community is planned to occur over 234 ha as the open cut pit, open cut pit water dam and site access road will traverse this community. The underground mine area also underlies approximately 643 ha of this community.

Table 9-2 provides a summary of the Brigalow Open Woodland (RE 10.3.3a) community's conservation status and brief description from the Regional Ecosystem Description Database (REDD). Ground cover along each secondary transect averaged 24% bare ground, 10% surface pebbles and rock, 22% leaf litter, 23% grass, 16% herbs and forbs and 5% low shrub. The Brigalow Open Woodland has a very open tussock grassland ground cover, with leaf litter and fallen timber having the potential to provide sheltered habitat for fauna species. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-2 Brigalow Open Woodland (RE 10.3.3a) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity Status
10.3.3a	<i>Eucalyptus cambageana</i> open-woodland with or without <i>Acacia harpophylla</i> understorey.	Not Listed	No Concern at Present

No listed flora species were identified within this community. Non-native species present within the Brigalow Open Woodland include paddy's Lucerne (*Sida spinosa*), buffel grass (*Cenchrus ciliaris*), common pest pear (*Opuntia stricta*) and velvety tree pear (*Opuntia tomentosa*).

RE 10.3.3a is protected at the Cudmore Resource Reserve and Cudmore National Park. The state wide remnant extent of this RE is greater than 10, 000 ha and more than 30% of its pre-clearing area remains.

Community 2 – Brigalow Open Woodland (RE 10.4.5)

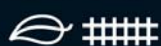
The Brigalow Open Woodland (RE 10.4.5) is located within the north-eastern portion of the Project site, along cracking black clay soil. No disturbance is planned for this community. Groundcover consisted of 46% bare ground, 27% grass, 17% leaf litter, 7% herbs and 3% tree or shrub stem cover. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-3 provides a brief description of RE 10.4.5 and its conservation status.

Table 9-3 Brigalow Open Woodland (RE10.4.5) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.4.5	<i>Acacia cambagei</i> low woodland with <i>Acacia harpophylla</i> on Cainozoic lake beds	Not Listed	Of Concern

No threatened species were identified within this community. Introduced and naturalised floral species within RE 10.4.5 include buffel grass (*Cenchrus ciliaris*), red natal grass (*Melinis repens*), awnless barnyard grass (*Echinochloa colona*) and common pest pear (*Opuntia stricta*). Regionally, this RE is subject to clearing for pasture development and is prone to moderate pasture degradation. There is



potential for parthenium (*Parthenium hysterophorus*) (Weed of National Significance and Class 2 declared weed under the *Land Protection (Pest and Stock Route Management) Act 2002* [LP Act]) invasion on the heavy clay soils. The cracking clays cause major physical disturbance of plant roots and annual plants have only a short growing season. The state-wide extent of this RE included in reserves is low and includes the Moorrinya National Park. In December 2006, the state-wide remnant extent was greater than 10,000 ha and entailed greater than 30% of the original pre-clearing area.

Community 3 – Brigalow Open Woodland (RE 10.9.3)

The Brigalow Open Woodland (RE 10.9.3) occurred in the southwest portion of the Project, in small, disjunct patches. A complete listing of flora species found within this RE is provided in the Volume 2, Appendix L1. This community will not incur surface disturbance, although workings will occur below the surface over approximately 17 ha. Refer to Table 9-4 for a brief description of RE 10.9.3 and conservation status.

Table 9-4 Brigalow Open Woodland (RE 10.9.3) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.9.3	<i>Acacia harpophylla</i> and/or <i>Eucalyptus cambageana</i> open woodland to woodland on Mesozoic sediments	Not Listed	Endangered

No threatened species were identified inhabiting this community. Potential threats to this community are mainly from tree clearing, high susceptibility to salinity, weed infestation (particularly from *Parthenium* spp.), over grazing and soil erosion. This RE is considered rare (800 ha in total area) for the bioregion, and occurs in a scattered and disjunct distribution. It is considered a naturally restricted RE. Being naturally restricted is not a threatening process in itself, however, the ecosystem is considered threatened as one comparatively small event may lead to extinction (Mitchell et al., 2002). RE 10.9.3 is represented in the Cudmore National Park.

Community 4 – Brigalow Open Woodland (RE 11.3.5)

The Brigalow Open Woodland (RE 11.3.5) has been identified using DERMs Regional Ecosystem Mapping tool as occurring within the eastern portion of the Project site, along the proposed railway and roadway corridors. However, due to restrictions associated with site access of the railway corridor, data on this RE is yet to be collected. Based on the DERM maps and proposed surface disturbance footprint, 5.7 ha of this RE will be impacted.

Table 9-5 provides a brief description of the RE and its conservation status.

Table 9-5 Brigalow Open Woodland (RE 11.3.5) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
11.3.5	<i>Acacia cambagei</i> +/- <i>A. harpophylla</i> low woodland or open-forest sometimes clumped, on Cainozoic alluvial plains.	Not Listed	Of Concern

Data on threatened species within this Regional Ecosystem is yet to be collected.



Reserves in which this RE occurs include the Culgoa Floodplain National Park, Epping Forest National Park, Nairana National Park, Mazeppa National Park and the Narrien Range National Park. In December 2006, the remnant bioregional extent of this RE was greater than 10,000 ha and greater than 30% of the original pre-cleared area remained. The Of Concern listing for this RE under DERMs Biodiversity Status is due to broad scale vegetation clearing, increasing fragmentation and loss of remnant area.

Community 5 – Silver-leaved Ironbark Open Woodland (RE 10.3.28a)

The Silver-leaved Ironbark Open Woodland (RE 10.3.28a) occurs along headwaters of Well Creek, and the alluvial plains of Sandy Creek and Little Sandy Creek. Infrastructure plans for the Project include an access road through this community and an overall surface disturbance of 70.8 ha. Mining activities will also occur below this community over approximately 464 ha. The Brigalow Open Woodland (RE 10.4.5) community conservation status and brief description from REDD is found in Table 9-6 Groundcover consisted of 46% bare ground, 27% grass, 17% leaf litter, 7% herbs and 3% tree or shrub stem cover. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-6 Silver-leaved Ironbark Open Woodland (RE 10.3.28a) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.3.28a	<i>Eucalyptus melanophloia</i> -dominated open woodland with very sparse to sparse canopy on sandy alluvial fans	Not Listed	No Concern at Present

No flora species of conservation significance were identified within this community, which is consistent with all database searches undertaken prior to the site visit. This vegetation community has been colonised with several introduced species, including red natal grass (*Melinus repens*), buffel grass (*Cenchrus ciliaris*), common pest pear (*Opuntia stricta*), shrubby stylo (*Stylosanthes scabra*) and blackberry nightshade (*Solanum nigrum*).

RE 10.3.28 is protected within Cudmore National Park, Cudmore Resource Reserve and White Mountains National Park. In December 2006, the state wide remnant extent of RE 10.3.28 was greater than 10,000 ha and greater than 30% of the pre-clearing area remained.

Largely for RE 10.3.28, the top soils on upper slopes are susceptible to sheet erosion while on the lower slopes the top soils are deeper and have better water-holding capacity yet are subject to flooding and salinity. Revegetation after loss of top soil and exposure of the clayey subsoil is expected to be difficult and very slow.

Community 6 – Silver-leaved Ironbark Open Woodland (RE 10.5.5a)

The Silver-leaved Ironbark Open Woodland (RE 10.5.5a) is the dominant vegetation community on the Project site. It occurs along orange and red sandy plains. Planned disturbance within this community includes the open cut pit, pit water dams, creek diversion levees, product stockpiles, environmental dams drain, clean water storage, light industrial area, train load out facility, rail spur, dragline construction pad, construction accommodation village, operational accommodation village, security



facility, airport, access road, power line and water pipeline. Approximately 2,020 ha of this community will be cleared or otherwise impacted as a result of mine construction activities. Additionally, the underground mine area in the western portion of site underlies nearly 5,500 ha of this vegetation community.

The Silver-leaved Ironbark Open Woodland contained a sparse shrub layer with a relatively dense grassy groundcover with an average of 21% bare ground, 19% leaf litter, 53% grass, 5% herbs and forbs and 2% shrubs. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-7 summarises the REDD short description and conservation status of RE 10.5.5a.

Table 9-7 Silver-leaved Ironbark Open Woodland (RE 10.5.5a) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.5.5a	<i>Eucalyptus melanophloia</i> open woodland with very sparse canopy on sand plains	Not Listed	No Concern at Present

No flora species of conservation significance were identified within RE 10.5.5. This vegetation community has been colonised with several introduced species, including red natal grass (*Melinis repens*), buffel grass (*Cenchrus ciliaris*), common pest pear (*Opuntia stricta*), shrubby stylo (*Stylosanthes scabra*) and blackberry nightshade (*Solanum nigrum*).

RE 10.5.5 is protected within Cudmore National Park and Cudmore Resource Reserve. In December 2006, its state-wide remnant extent was greater than 10,000 ha and more than 30% of the pre-clearing area remained. In 2002, the bioregional area of RE 10.5.5 held within national parks was 1,722 ha (Mitchell et al., 2002). Current threatening processes for the state wide occurrence of RE 10.5.5 includes clearing for pasture development.

Community 7 – Silver-leaved Ironbark Open Woodland (RE 10.7.11a)

The Silver-leaved Ironbark Open Woodland (RE 10.7.11a) occurs along the eastern portion of the Project site, along low hill slopes. Planned disturbance within this community includes the clean water storage, operational accommodation village and construction accommodation village, comprising approximately 63.8 ha.

The community profile is summarised in Table 9-8. The Silver-leaved Ironbark Open Woodland (RE 10.7.11a) has a predominantly rocky groundcover and was sparsely grassed. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-8 Silver-leaved Ironbark Open Woodland (RE 10.7.11a) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.7.11a	<i>Eucalyptus melanophloia</i> - dominated open woodland with very sparse canopy on Tertiary surface	Not Listed	No Concern at Present



No flora species of conservation significance were identified within RE 10.7.11a. This RE is represented within the Cudmore National Park and Cudmore Resource Reserve. RE 10.7.11 is widespread in eastern parts of the Desert Uplands Bioregion (Bioregion 10). In December 2006, the state-wide remnant extent was greater than 10,000 ha and more than 30% of the pre-clearing area remained.

Community 8 – Silver-leaved Ironbark Open Woodland (RE 11.8.4)

The Silver-leaved Ironbark Open Woodland (RE 11.8.4) occurs along the eastern portion of the Project site and will be potentially disturbed by the access road over approximately 28.5 ha. Groundcover within this community averaged 50% grass, 6% bare ground, 13% leaf litter and 21% herbs and forbs. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-9 summarises the REDD description and conservation status within this community.

Table 9-9 Silver-leaved Ironbark Open Woodland (RE 11.8.4) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
11.8.4	<i>Eucalyptus melanophloia</i> woodland generally occurring on slopes of steep mountains and hills formed from Cainozoic igneous rocks usually with shallow stony soils and extensive outcropping.	Not Listed	No Concern at Present

No flora species of conservation significance were identified within RE 11.8.4. This RE is protected within Carnarvon National Park, Minerva Hills National Park, Homevale National Park, Kroombit Tops National Park, Peak Range National Park and Homevale Resource Reserve. The regional extent of this community contained in reserves is classed as high. In December 2006, the state-wide remnant extent was greater than 10,000 ha and more than 30% of the pre-clearing area remained.

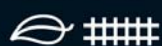
Community 9 – Poplar Box Open Woodland (RE 10.3.27a)

The Poplar Box Open Woodland (RE 10.3.27a) is located in small patches along alluvial plains. Planned infrastructure within this community includes the open cut pit and access road totalling approximately 174 ha. The underground mine area also underlies approximately 685 ha of this community. Average ground cover along each secondary transect consisted of 43% grass cover, 19% bare ground, 21% leaf litter, 9% herbs and forbs and 8% stem cover from trees and shrubs. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

The Poplar Box Open Woodland (RE 10.3.27a) community profile is summarised in Table 9-10.

Table 9-10 Poplar Box Open Woodland (RE 10.3.27a) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.3.27a	<i>Eucalyptus populnea</i> – dominated open woodland to woodland with very sparse to sparse canopy on alluvial plains.	Not Listed	Of Concern



No flora species of conservation significance were found within the community. Non-native species that inhabit this community include the prickly pear (*Opuntia stricta*), velvety tree pear (*Opuntia tomentosa*), shrubby stylo (*Stylosanthes scabra*) and buffel grass (*Cenchrus ciliaris*).

RE 10.3.27a is listed as Of Concern under DERMs Biodiversity Status. Threatening processes include increasing salinity due to clearing of recharge areas, clearing for pasture development and woody weed invasion due to high total grazing pressures. RE 10.3.27 is currently protected within the Cudmore National Park and Cudmore Resources Reserve. In December 2006, the state wide remnant extent was greater than 10,000 ha and greater than 30% of the pre-clearing area remained.

Community 10 – Poplar Box Open Woodland (RE 10.5.12)

The Poplar Box Open Woodland (RE 10.5.12) community occurs along sandy plains across the Project site. Proposed disturbance within this community includes the pit water dam, light industrial area, clean water storage, access road and power line. Approximately 540 ha of vegetation will be impacted by construction activities and 2,480 ha of this community exist above proposed mining works.

The summarised community profile is located in Table 9-11. The underground mine workings will underlie this community as well, however impacts from this will be minimal. Groundcover within this community averaged 11% bare ground, 29% leaf litter, 44% grass, 10% herbs and forbs and 6% stem cover from trees and shrubs. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-11 Poplar Box Open Woodland (RE 10.5.12) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.5.12	Open-woodland to woodland of <i>Eucalyptus populnea</i> with sparse ground layer of <i>Triodia pungens</i> and/or tussock grasses on sand plains.	Not Listed	No Concern at Present

No flora species of conservation significance were found within the community. Non-native species which inhabit this community include the common pest pear (*Opuntia stricta*), velvety tree pear (*Opuntia tomentosa*), stinkgrass (*Eragrostis cilianensis*), red natal grass (*Melinis repens*), shrubby stylo (*Stylosanthes scabra*) and buffel grass (*Cenchrus ciliaris*). The Poplar Box Open Woodland community is currently protected within the Cudmore National Park and Cudmore Resources Reserve. The state wide remnant extent was greater than 10,000 ha. More than 30% of the total state wide pre-clearing area remained in 2006.

Community 11 – Poplar Box Open Woodland (RE 11.3.2)

This RE has been identified using DERMs Regional Ecosystem Mapping tool as occurring within the eastern portion of the Project site, along the proposed railway and roadway corridors. However, due to restrictions associated with site access of the railway corridor, data on this Regional Ecosystem is yet to be collected. Proposed infrastructure plans include a railway line which traverses this community, affecting 4.5 ha. Based on DERM mapping and the proposed disturbance footprint, 4.5 ha of this community will be impacted as a result of construction activities.



Weeping Myall (*Acacia pendula*) is known to be associated with this RE, and targeted searches for this species will need to be conducted to ascertain the presence or absence of Weeping Myall Woodlands, which is listed as an Endangered Ecological Community under the EPBC Act.

The REDD short description and conservation status of the Poplar Box Open Woodland (RE 11.3.2) is presented in Table 9-12.

Table 9-12 Poplar Box Open Woodland (RE 11.3.2) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
11.3.2	<i>Eucalyptus populnea</i> woodland to open-woodland on alluvial plains	Not Listed	Of Concern

Data on threatened species within this Regional Ecosystem is yet to be collected.

There are a number of protected areas in which RE 11.3.2 is represented including Carnarvon National Park, Taunton National Park (Scientific) and Carraba Conservation Park; however, the extent of area within reserves is deemed as low. In December 2006, state-wide remnant extent of RE 11.3.2 was greater than 10,000 ha and 10-30% of the pre-clearing area remained.

Community 12 – Silver-leaved Ironbark/Poplar Box Mixed Woodland (RE 10.5.5a/10.5.12)

The Silver-leaved Ironbark/Poplar Box Mixed Woodland consists of a heterogeneous community of REs 10.5.5a and 10.5.12 that have been mapped as a single polygon. This community has a high spatial diversity, and with the 1:25,000 scale to which vegetation has been mapped for the Project site, it is not possible to spatially delineate these vegetation communities into homogenous units. This mixed woodland is located in several pockets within the central and western areas of the site. A significant proportion of this heterogeneous community (approximately 990 ha) is to be impacted by Project activities as it lies within the proposed disturbance footprint. Nearly 780 ha are also located above proposed underground mining areas.

Both of these REs are represented as individual communities on the Project site and are detailed in the descriptions above.

Neither of these REs is of conservation significance under Queensland legislation.

Community 13 – White Cypress Pine Woodland (RE 11.5.5b)

The White Cypress Pine (RE 11.5.5b) occurs in one small patch (approximately 3 ha) along the western boundary of site. The underground mine workings will be constructed below this RE. This community is considered an outlier for the western portion of the Project site as it is spatially within one bioregion but has an RE code from an adjacent bioregion. The White Cypress Pine Woodland found on-site effectively does not match any of the RE descriptions from within the Desert Uplands bioregion. Instead, it matches part of bioregion 11, the Brigalow Belt. This region therefore extends slightly into adjacent parts of the Desert Uplands bioregion, a phenomenon that can occur within the RE mapping framework (Neldner *et al.*, 2005).

The brief description provided by REDD and conservation status for the White Cypress Pine Woodland (RE 11.5.5b) is located in Table 9-13. Groundcover consisted of tussock grass species, with occasional forbs and bare ground. Average groundcover composition along secondary transects



averaged 23% bare ground, 13% leaf litter, 8% forbs and herbs, 52% tussock grass and 5% stem cover from Cypress Pine trees. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-13 White Cypress Pine Woodland (RE 11.5.5b) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
11.5.5b	Eucalyptus melanophloia, Callitris glaucophylla woodland on Cainozoic sand plains/remnant surfaces. Deep red sands.	Not Listed	No Concern at Present

No threatened flora species were identified within this community. Non-native species were found within this community, shrubby stylo (*Stylosanthes scabra*), common pest pear (*Opuntia stricta*), red natal grass (*Melinis repens*), feathertop rhodes grass (*Chloris virgata*) and the buffel grass (*Cenchrus ciliaris*).

White Cypress Pine Woodland is not listed as being of conservation significance under Queensland legislation. However, DERM has noted an ongoing threatening process – land clearing for pasture development, as occurring within this community type. Areas within the region which RE 11.5.5 is protected include Alton National Park, Morven National Park and Narrien Range National Park. The total mapped extent of RE 11.5.5 within Queensland as of 2006 was greater than 10,000 ha, with more than 30% of the pre-clear area remaining.

Community 14 – Gidgee Open Woodland (RE 10.3.4b)

This vegetation community is located in one small patch of around 1 ha along Rocky Creek. No disturbance is planned within this community however it does exist above proposed underground workings.

The Gidgee Open Woodland (RE 10.3.4b) community profile is summarised in Table 9-14. Groundcover within the Gidgee Open Woodland consisted of a very open tussocky grass layer and averaged 45% bare ground, 9% leaf litter, 13% grass, 28% forbs and 5% shrub and tree stem cover. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-14 Gidgee Open Woodland (RE 10.3.4b) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.3.4b	<i>Acacia cambagei</i> low open woodland to low woodland on alluvial plains with very open tussock grassland	Not Listed	Of Concern

No flora species of conservation significance were found within the community. One LP Act Class 2 pest species was identified within RE 10.3.4b, the velvety tree pear (*Opuntia tomentosa*).

RE 10.3.4b is listed as Of Concern under the DERM Biodiversity status. Impacts on this community include pasture degradation and significant loss of groundcover as a result of grazing pressures. Management strategies suggested by The Desert Uplands Biodiversity Assessment include adaptive



fire management and improved habitat protection within protected areas or other state and private lands (ANRA, 2009).

The regional extent of Gidgee Open Woodland community protected within parks and reserves is low, and includes the Moorrinya National Park. The remnant area of RE 10.3.4 mapped within Queensland, as of 2006, was greater than 10,000 ha. The total area of this community contained within national parks is 1,990 ha (Mitchell et al., 2002).

Community 15 – Fringing Riparian Woodland (RE 10.3.12a)

This community is associated along the floodplains of Sandy Creek. Proposed roadways and a product stockpile will transverse sections of this community, impacting an area of approximately 98 ha.

The Fringing Riparian Woodland (RE 10.3.12a) community profile in Table 9-15 provides the REDD description and associated conservation status. Groundcover within this community averages 13% bare ground, 24% leaf litter, 56% grass, 11% herbs and forbs and 1% shrubs. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-15 Fringing Riparian Woodland (RE 10.3.12a) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.3.12a	Fringing and frontage <i>Corymbia plena</i> and <i>C. dallachiana</i> open-woodland, usually with <i>Aristida</i> spp. dominant in the ground layer	Not Listed	No Concern at Present

No threatened species have been identified within this community on or adjacent to the Project site. The groundcover was predominantly buffel grass (*Cenchrus ciliaris*). This community is contained within the Cudmore Resource Reserve. In 2006, the total state wide extent of this RE was greater than 10,000 ha and more than 30% of the original pre-clear area remained.

Community 16 – Fringing Riparian Woodland (RE 10.3.13a)

This community is the predominant community of Well Creek and Sandy Creek. Proposed roadways will transverse sections of this community, potentially incurring surface disturbance of 146 ha, however this does not include any impacts of proposed creek diversions on downstream riparian vegetation. Approximately 327 ha of this community exist above proposed underground workings.

The Fringing Riparian Woodland (RE 10.3.13a) community profile in Table 9-16 provides the REDD description and associated conservation status. Groundcover within this community averages 23% bare ground, 22% leaf litter, 44% grass, 5% herbs and forbs and 1% shrubs. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-16 Fringing Riparian Woodland (RE 10.3.13a) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.3.13a	Riverine wetland or fringing riverine wetland. <i>Eucalyptus camaldulensis</i> open-woodland to woodland.	Not Listed	Of Concern

No threatened species have been identified within this community on or adjacent to the Project site. The groundcover composition was predominantly non-native species, including buffel grass (*Cenchrus ciliaris*) and couch grass (*Cynodon dactylon*).

This Fringing Riparian Woodland community is subject to degradation by weed invasion, including Rubber Vine (*Cryptostegia grandiflora*), and by high total grazing pressure, therefore this RE is not in a good condition. Protected areas that represent RE 10.3.13 include White Mountains National Park, Cudmore National Park, White Mountains Resource Reserve and Cudmore Resource Reserve. In 2006, the total state wide extent of this RE was greater than 10,000 ha and more than 30% of the original pre-clear area remained.

Community 17 – Fringing Riparian Woodland (RE 10.3.14)

The Fringing Riparian Woodland (RE 10.3.14) occurs along most watercourses on the Project site. Access roads, the pit water dam and the open cut pit are proposed within this community, potentially affecting 541 ha. Underground mining will occur below this community over approximately 593 ha. The open cut pit will necessitate a diversion of Little Sandy Creek into larger Sandy Creek.

A brief description and conservation status for the Fringing Riparian Woodland (RE 10.3.14) is summarised in Table 9-17. Average ground cover along each secondary transect consisted of 43% grass cover, 19% bare ground, 7% herbs and forbs and 24% litter and 3% stem cover from shrubs and trees. A complete listing of flora species found within this RE is provided in the Appendix of the AustralAsian Resource Consultants (AARC) 2011 Flora and Fauna Assessment report (Volume 2, Appendix L1).

Table 9-17 Fringing Riparian Woodland (RE 10.3.14) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.3.14	<i>Eucalyptus camaldulensis</i> woodlands and open-woodlands on channels, levees and floodplains with sandy to clayey soils.	Not Listed	Of Concern

No flora species of conservation significance were identified during all surveys conducted within the Fringing Riparian Woodland (RE 10.3.14). This RE was in a relatively poor condition as a result of the non-native species identified within this community, including mimosa (*Acacia farnesiana*), red natal grass (*Melinis repens*), feathertop rhodes grass (*Chloris virgata*), buffel grass (*Cenchrus ciliaris*), shrubby stylo (*Stylosanthes scabra*), common pest pear (*Opuntia stricta*) and velvety tree pear (*Opuntia tomentosa*) among others.

Threatening processes include weed invasion, particularly parkinsonia (*Parkinsonia aculeate*), and total grazing pressure leading to soil and pasture degradation. Feral pigs are also attracted to these areas and cause major soil disturbance, the fouling of water holes and destruction of wildlife and habitat. In 2005, the remnant extent of RE 10.3.14 was greater than 10,000 ha. This RE is protected within the Moorrinya National Park, Forest Den National Park, White Mountains National Park, Cudmore National Park, White Mountains Resource Reserve and Cudmore Resource Reserve. Recommended recovery actions include fire management, habitat protection on private lands, habitat retention through reserves, research and weed control (ANRA, 2009).



Community 18 – Weeping Bottlebrush Heath (RE 10.7.7a)

The Weeping Bottlebrush Heath (RE 10.7.7a) patchily inhabits the western and central portions of site, along hard setting soils. Planned infrastructure which may disturb this community includes pit water dams, the power line and access route corridors, covering an area of approximately 120 ha. This community will overlay approximately 242 ha of underground mine workings. Table 9-18 provides a brief REDD description and the conservation status for Weeping Bottlebrush Heath (RE 10.7.7). Average groundcover composition along transects was 20% bare ground, 2% surface pebbles, 23% leaf litter, 39% grass, 7% herbs and forbs and 9% stem cover from shrubs and trees. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-18 Weeping Bottlebrush Heath (RE 10.7.7a) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.7.7a	<i>Melaleuca</i> spp. and/or <i>Acacia leptostachya</i> shrubland on ferricrete (eastern)	Not Listed	No Concern at Present

No species of conservational significance were identified within this community. The Weeping Bottlebrush Heath (RE 10.7.7a) was relatively healthy, with minimal establishment of non-native species, with red natal grass (*Melinis repens*) and shrubby stylo (*Stylosanthes scabra*) being encountered.

RE 10.7.7 is not listed as being threatened under any of the relevant legislation. Areas within the greater region which this RE is protected include the White Mountains National Park, Cudmore Resource Reserve and Cudmore National Park. The state wide extent of this RE was greater than 10,000 ha in December 2006. It has been noted in the 2002 Biodiversity Audit of the Desert Uplands Bioregion (Mitchell et al., 2002) that RE 10.7.7 is recognised as being particularly high in floristic values, as a high number of species inhabits this community.

Community 19 – Thozet's Box Woodland (RE 10.7.5)

Thozet's Box Woodland (RE 10.7.5) occurs along hills with skeletal soils in patchy distributions around the Project site. Disturbance from planned infrastructure covers approximately 62 ha and includes access roads, power line and a pit water dam. Approximately 76 ha of this RE occur above proposed underground mining activities.

Table 9-19 summarises the Thozet's Box Woodland (RE 10.7.5) vegetation community profile. Groundcover averaged 25% bare ground, 21% leaf litter, 10% surface rock and pebble, 24% grass tussock, 5% herbs and 15% shrub and tree stems. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

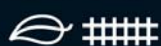


Table 9-19 Thozet's Box Woodland (RE 10.7.5) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.7.5	<i>Eucalyptus thozetiana</i> open woodland on scarps and on pediments below scarps	Not Listed	Of Concern

No flora species of conservation significance were found within the Thozet's Box Open Woodland (RE 10.7.5). One introduced species, buffel grass (*Cenchrus ciliaris*), was identified. The communities were discovered in good condition despite the presence of *C. ciliaris*, as native grass species persist on site (including *Triodia*, *Themeda* and *Enchylaena* spp) and no exotic species were detected within the tree and/or shrub layers.

Threatening processes include scalding, groundcover degradation, and high salinity. The soils are shallow with low water holding capacity, low fertility and high salinity. The nature of the soils, often steep slopes and the very sparse ground cover of plants render this ecosystem highly susceptible to erosion. The Desert Uplands Biodiversity Assessment (ANRA, 2009) recommends protective measures including improved fire management, habitat protection within private lands and research.

Areas within which the Thozet's Box Open Woodland is protected include Cudmore National Park, Cudmore Resource Reserve and Moorrinya National Park. In December 2006, the state wide remnant extent was greater than 10,000 ha and more than 30% of the pre-clearing area remained.

Community 20 – Lancewood Woodland (RE 10.7.3b)

The Lancewood Open Woodland (RE 10.7.3b) occurs along skeletal hill slopes and escarpments in large patches along the eastern and western portions of site. Potential disturbance to this community may cover 147 ha from the construction of planned pit water dams, access roads and power lines. This community will overlay approximately 572 ha of underground mining activities.

This community's REDD description and conservation status are summarised in Table 9-20. Average composition of groundcover was 21% bare ground, 25% rock and surface pebbles, 3% forbs and herbs, 34% leaf litter, 13% grass and 4% fallen timber. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-20 Lancewood Woodland (RE 10.7.3b) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.7.3b	<i>Acacia shirleyi</i> woodland at margins of plateaus	Not Listed	No Concern at Present

No endangered, vulnerable or near threatened flora species were found within the Lancewood Woodland (RE 10.7.3b). Class 2 listed weeds (under the LP Act) have been identified within this community type - the common pest pear (*Opuntia stricta*) and velvety tree pear (*Opuntia tomentosa*). Additional non-native species identified within RE 10.7.3b include the West-Indian gherkin (*Cucumis anguria* var. *anguria*), red natal grass (*Melinis repens*), buffel grass (*Cenchrus ciliaris*) and shrubby stylo (*Stylosanthes scabra*).

RE 10.7.3 is not listed as threatened under state or national legislation. Areas within the region which this RE is protected include White Mountains National Park, Cudmore National Park, Cudmore



Resource Reserve, White Mountains Resource Reserve, Dalrymple National Park and Moorrinya National Park. The total mapped area within Queensland of this RE in 2006 was greater than 10,000 ha.

The soils within RE 10.7.3b are shallow with low water holding capacity and low fertility. The nature of the soils and the sparse ground cover of plants cause this ecosystem to be highly susceptible to erosion. Fire management requires consideration of the effect of the expected slow recovery rate of plant cover and the sensitivity to burning of species such as Lancewood.

Community 21 – Lancewood Woodland (RE 10.10.1b)

The Lancewood Woodland (RE 10.10.1b) occurs within one patch of approximately 115 ha along the western boundary of site, on a sandstone ridge. No surface disturbance is proposed for this community, however underground workings are planned below this RE.

A brief REDD description and conservation status for the Lancewood Woodland (RE 10.10.1b) is summarised in Table 9-21 below. Groundcover along transects averages 45% bare ground, 35% leaf litter, 14% grasses and 6% herbs and forbs. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-21 Lancewood Woodland (RE 10.10.1b) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.10.1b		Not Listed	No Concern at Present

No threatened species were identified within RE 10.10.1b. One non-native species was identified, the common pest pear (*Opuntia stricta*). Areas which this community is protected include the White Mountains National Park, Cudmore National Park, White Mountains Resource Reserve and Cudmore Resource Reserve. In 2006, the state wide extent of RE 10.10.1b was greater than 10,000 ha.

Community 22 – Queensland Yellowjacket Low Open Woodland (RE 10.5.1c)

The Queensland Yellowjacket Low Open Woodland (RE 10.5.1c) occurs along sand plains, within the eastern portion of site. Proposed disturbance plans within this community total 80 ha and include the airport, power line and access road. Approximately 9 ha occur above proposed underground operations. Table 9-22 summarises the short description from REDD and conservation status for the Queensland Yellowjacket Low Open Woodland (RE 10.5.1c). This vegetation community consisted of a mid-dense grassy ground layer, with exposed patches of bare ground. Average groundcover composition was 24% bare ground, 43% grass, 29% leaf litter, 3% herbs and forbs and 1% stem cover from trees. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Table 9-22 Queensland Yellowjacket Low Open Woodland (RE 10.5.1c) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.5.1c		Not Listed	No Concern at Present

No flora species of conservation significance were found within the Queensland Yellowjacket Low Open Woodland (RE 10.5.1c). The common pest pear (*Opuntia stricta*) was identified within this community.

RE 10.5.1 is not listed under any national or state legislation. This RE is protected regionally within the White Mountains National Park, White Mountains Resource Reserve, Cudmore Resource Reserve and Cudmore National Park. In December 2006, remnant extent was greater than 10,000 ha and greater than 30% of the pre-clearing area remained

The soils in this ecosystem have exceptionally low nutrient status and excessive permeability. The loose sandy top soils are highly susceptible to erosion. Extensive areas have historically been only lightly grazed due to presence of poison heartleaf (*Gastrolobium grandiflorum*) and absence of surface water. Potential threats include wildfires, inappropriate burning regimes and clearing for pasture development. The Desert Uplands Biodiversity Audit (Mitchell et al., 2002) predicts this RE to hold a high faunal diversity due to the historic lack of grazing.

Community 23 – Rustyjacket Open Woodland (RE 10.10.4)

The Rustyjacket Open Woodland (RE 10.10.4) has been identified using DERMs Regional Ecosystem Mapping tool as occurring in one area of approximately 296 ha on the western boundary of the Project site. This area will not be affected by surface disturbance; however mining activities will occur beneath the surface. Due to restrictions associated with site access in this area, data on this RE is yet to be collected.

A REDD description and conservation status for this RE is provided in Table 9-23 below.

Table 9-23 Rustyjacket Open Woodland (RE 10.10.4) description and Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
10.10.4	<i>Eucalyptus exilipes</i> and/or <i>Corymbia leichhardtii</i> open woodland on sandstone ranges	Not Listed	No Concern

Data on threatened species within this Regional Ecosystem is yet to be collected.

The Rustyjacket Open Woodland RE 10.10.4 is not of any conservational significance within Queensland legislation and is not listed within any EPBC Threatened Communities. Reserves in which this RE occurs include White Mountains National Park, Cudmore National Park and Cudmore Resources Reserve. In December 2006, greater than 10,000 ha and over 30% of the pre-clearing area remained.



Community 24 – Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (RE 11.8.11)

The Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basins an EPBC listed Endangered Community within which RE 11.8.11 is included. This area occurs along the eastern portion of the Project; with planned disturbance from proposed railway and access road corridors potentially affecting 22 ha. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

The short REDD description, corresponding conservation status and dominant flora species for this community are summarised in Table 9-24 below.

Table 9-24 Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (RE 11.8.11) description and corresponding Conservation Status

RE	DERM RE Descriptor	Conservation Status	
		EPBC Act	DERM Biodiversity
11.8.11	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	Endangered	Of Concern

No threatened species were identified within this community. Identified non-native species include buffel grass (*Cenchrus ciliaris*), caustic weed (*Chamaesyce drummondii*) and paddy's lucerne (*Sida spinosa*).

This Endangered EPBC community is also classified Of Concern within the DERM Biodiversity Status and the VM Act (which does not apply).

RE 11.8.11 is protected within the Albinia National Park, Peak Range National Park, Carnarvon National Park, Albinia Conservation Park, Albinia Resource Reserve and Minerva Hills National Park. In December 2006, remnant extent was greater than 10,000 ha and 10-30% of the pre-clearing area remained.

Community 25 – Non-remnant Grassland

Non-remnant Grassland is a dominant community throughout the central and western portions of the site, occupying over 10,000 ha (or nearly 30%) of the total site area. Approximately 3,000 ha of this Non-remnant Grassland are proposed to be disturbed by both open cut pits, the coal handling and preparation plant, tailings storage facility, access roads, pit water dams, the creek diversion and Rocky Creek Connector drain system, and the train loading facility. 6,700 ha of this community will overlay proposed underground operations.

During the wet season survey, ground cover was dense, with an average cover of approximately 62% grass, 5% bare ground, 13% herbs and forbs and 20% litter. Dry season surveys held differing structural composition, with an average of 58% grass, 32% bare ground, 3% herbs and forbs and 6% leaf litter. A complete listing of flora species found within this RE is provided in Volume 2, Appendix L1.

Pest Plants (Weeds) listed under the LP Act

Three weed species declared as Class 2 weeds under the LP Act were recorded on the Project site during surveys; the common pest pear (*Opuntia stricta*), velvety tree pear (*Opuntia tomentosa*) and parkinsonia (*Parkinsonia aculeate*) The Class 2 classification means that the pests are established in



Queensland and have caused, or have the potential to cause adverse economic, environmental and/or social impacts.

The management of these species requires regional coordination and the development of programs led by the local government, community and/or landowners. Under the LP Act, landowners must take reasonable steps to keep their land free of Class 2 pests.

Information is provided below on each weed identified within the Project site. Fact sheets for the identified weeds are provided in Volume 2, Appendix L1

Common Pest Pear

The common pest pear (*Opuntia stricta*) is one of a number of cacti collectively called “prickly pear”. The prickly pear term includes species of *Opuntia*, *Nopalea* and *Acanthocereus*. In terms of distribution, *O. stricta* occurs throughout most of central and southern Queensland and is spreading westwards. It is found in small to large clumps of varying density. It is a bushy spreading plant up to 1.5 m in height with stems dividing in oval, blue-green spineless pads. Flowers are bright lemon yellow and green at the base with an oval shaped, purple fruit.

It was noted that Opuntia stricta was well established on the Project site and was identified within the Brigalow (*Acacia harpophylla*) Open Woodland, Silver-leaved Ironbark (*Eucalyptus melanophloia*) Open Woodland, Poplar Box (*Eucalyptus populnea*) Open Woodland, Fringing Riparian Woodland, White Cypress Pine (*Callitris glaucophylla*) Woodland, Silver-leaved Ironbark / Poplar Box Mixed Woodland, Non-remnant Grassland, Lancewood (*Acacia shirleyi*) Woodland, and Queensland Yellowjacket (*Eucalyptus similis*) Low Open Woodland.

Velvety Tree Pear

The velvety tree pear (*Opuntia tomentosa*) is another of the cacti collectively called “prickly pear”. *O. tomentosa* is found predominantly throughout the Brigalow Belt of Queensland and is still extending its range. It is occasionally found as dense shrubs, but more usually as small clumps of trees or as trees scattered over the landscape. It is a tree-like plant that forms a central woody trunk. Stems dividing into oblong pads are velvety to touch due to the dense covering of short fine hairs. Flowers are deep orange and contain deep red, egg-shaped fruit.

Opuntia tomentosa has become established within the following communities on the Project site: Brigalow Open Woodland; Poplar Box Open Woodland; Silver-leaved Ironbark / Poplar Box Mixed Woodland; Non-remnant Grassland; Gidgee (*Acacia cambagei*) Open Woodland; Fringing Riparian Woodland; and Lancewood Woodland.

Parkinsonia

Parkinsonia (*Parkinsonia aculeata*) can grow to 8 m in height, although smaller plants are more common. It can be single-stemmed or multi-stemmed with flat leaves and a green leaf stalk. Seed pods are straight with bulges around seeds and points on both ends and generally contain 1 – 4 seeds. Flowers consist of four yellow petals and one erect orange or orange spotted petal.

Parkinsonia aculeata was discovered on the Project site within the White Cypress Pine, Fringing Riparian Woodland and Non-remnant grassland communities.

Environmental Values

Vegetation community specific values include:



- REs 11.8.11 which is included within the Endangered EPBC Community Natural Grasslands of the Central Highlands and northern Fitzroy Basin;
- Relatively intact patches of Poplar Box Open Woodland, Gidgee Open Woodland, Fringing Riparian Woodland and Thozet's Box Open Woodland that are listed as Of Concern under DERMs Biodiversity Status;
- Fringing Riparian Woodland which provides refuge for fauna by providing water, shade and mature, hollow bearing tree species; and
- Fallen timber within the Brigalow Open Woodland and Gidgee Open Woodland has the potential to provide a distinct microhabitat for certain fauna, including the listed yakka skink and brigalow scaly-foot.

9.3.2 Potential Impacts and Mitigation Measures

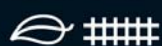
9.3.2.1 Potential Impacts

Maintaining stands of vegetation across the Project site is important for reasons such as maintaining high biodiversity levels, carbon sequestration, and aiding an ecosystems ability to maintain an assimilative capacity. Vegetation also assists with the management of anthropogenic activities by providing natural solutions to environmental problems such as soil and bank stabilisation, and reducing the risk of salinity and overland flow. Vegetation also provides important habitat for a range of fauna species.

Edge effects resulting from the proposed works can include the establishment of weeds, alteration to microclimatic conditions (such as greater light intensity, more wind penetration, lower humidity) and a reduction in plant health through loss of photosynthetic potential (as a result of plants being covered by dust generated from vehicle movement on unsealed tracks). In the absence of appropriate control measures, the Project has the potential to cause impacts in relation to edge effects, and particularly in relation to the introduction and / or spread of weed species throughout the Project site.

The following potential impacts on flora values may result from the proposed works at the Project site:

- Land clearing and mining activities may reduce the available habitat for native flora species on the Project site;
- A loss of habitat connectivity across the mine infrastructure and pit areas;
- Loss of vegetation communities listed as having a high biodiversity status;
- Increase pressure upon vegetation communities that remain following site development;
- Spread and introduction of weed seeds/propagules on footwear, machinery, vehicles and materials required for mine operation and construction;
- Potential weed invasion from earthworks activities in sensitive areas, particularly along watercourses; and
- Increased incidence of fire due to inappropriate fire regimes or accidental burning. Too frequent fires, or burning at the wrong time, may disrupt the life cycle of flora species leading to unpalatable grasses for cattle and increased incidents of woody and annual weeds such as parthenium and parkinsonia.



- Table 9-25 provides a summary of vegetation communities identified on the Project site, the RE conservational status and the extent of surface disturbance proposed within each community. Figure 9-5 provides location of the proposed mine infrastructure and vegetation communities.

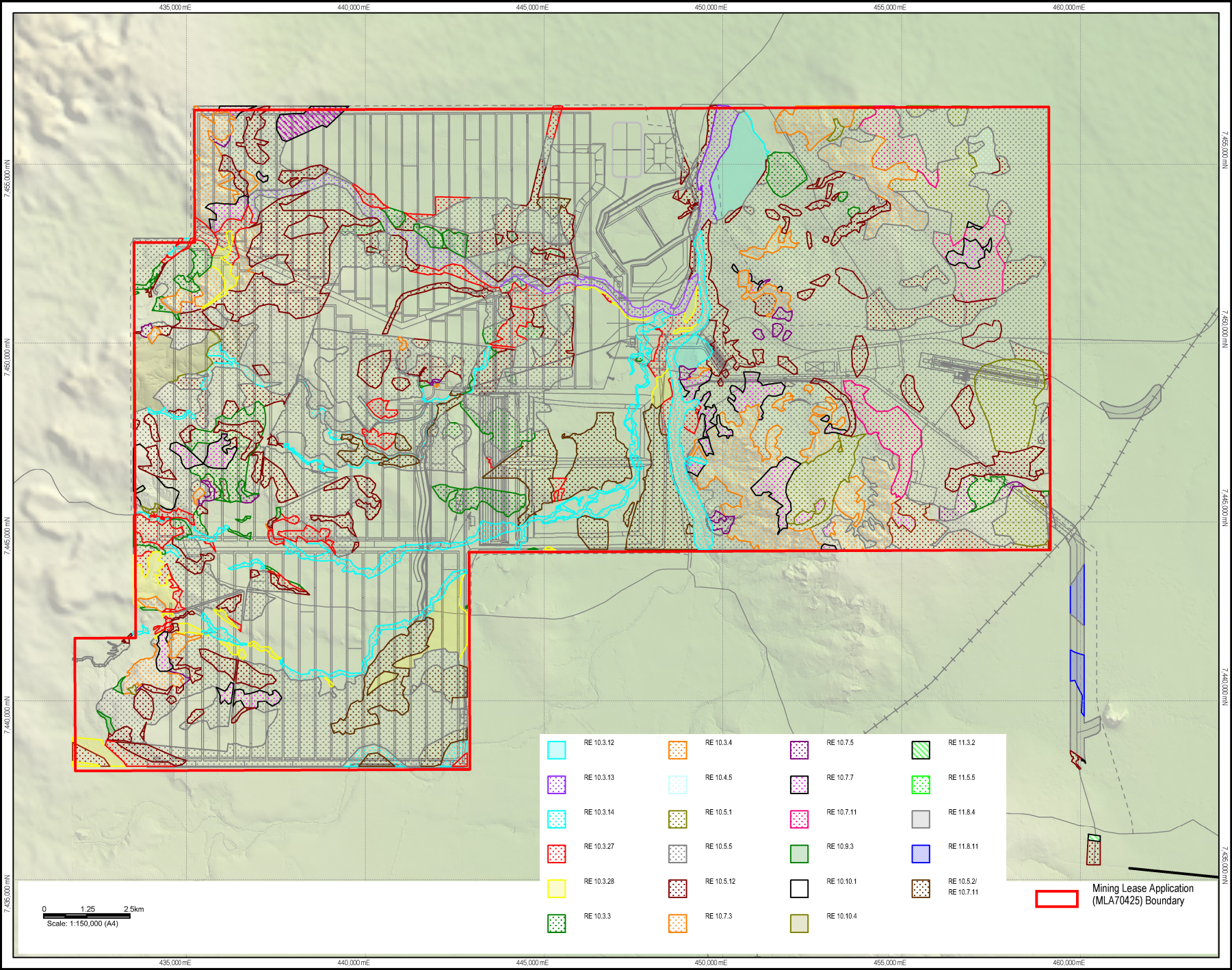
Table 9-25 Vegetation Communities, Associated Conservation Status and Extent of Clearing and/or Subsidence from Mining Activities

Vegetation Community	RE	EPBC (1999) Status	DERM Biodiversity Status	Total Area on Site (ha)	Cleared Area (Proposed) (ha)	RE to be cleared (%)	Area of Subsidence (ha)
Brigalow Open Woodland	10.3.3a	NL	NCAP	1,036	234.1	22.6	643.5
	10.4.5	NL	OC	71.1	0	0	0
	10.9.3	NL	E	16.7	0	0	16.7
	11.3.5	NL	OC	34.4	5.7	16.6	0
Silver-leaved Ironbark Open Woodland	10.3.28a	NL	NCAP	559.3	70.8	12.7	464.2
	10.5.5a	NL	NCAP	11,870	2,022	17.0	5,499
	10.7.11a	NL	NCAP	197.7	28.5	14.4	0
	11.8.4	NL	NCAP	197.7	28.5	14.4	0
Poplar Box Open Woodland	10.3.27a	NL	OC	894.6	174.3	19.5	685.0
	10.5.12	NL	NCAP	4,072	542.2	13.3	2,480
Poplar Box Open Woodland	11.3.2	E	OC	20.1	4.5	22.3	0
Poplar – Ironbark Mixed Woodland	10.5.12/ 10.5.5a	NL	OC	1,763	991.8	56.3	778.3
White Cypress Pine Woodland	11.5.5b	NL	NCAP	3	0	0	3
Gidgee Open Woodland	10.3.4	NL	OC	1	0	0	1
Fringing Riparian Woodland	10.3.12a	NL	NCAP	341.8	97.9	28.6	0
	10.3.13a	NL	OC	575.4	146.8	25.5	326.7
	10.3.14	NL	OC	1,099	541.2	49.2	593.5
Weeping Bottlebrush Heath	10.7.7	NL	NCAP	704.3	120.1	17.0	242.5
Thozet's Box Open Woodland	10.7.5	NL	OC	228.6	62.3	27.2	75.7
Lancewood	10.7.3b	NL	NCAP	2,168	147.2	6.8	572.1



Vegetation Community	RE	EPBC (1999) Status	DERM Biodiversity Status	Total Area on Site (ha)	Cleared Area (Proposed) (ha)	RE to be cleared (%)	Area of Subsidence (ha)
Woodland	10.10.1b	NL	NCAP	115.9	0	0	115.9
Queensland Yellowjacket Low Woodland	10.5.1c	NL	NCAP	1,235	80.1	6.5	9.2
Rustyjacket Open Woodland	10.10.4	NL	Least Concern	296.6	0	0	296.6
Natural Grasslands of the Central Highlands and northern Fitzroy Basin	11.8.11	E	OC	169.7	22.3	13.1	0
Non-remnant Grassland	Not classified	NL	NL	10,200	2,988	29.3	6,704
Total Areas				38,365.7	8,343.6	21.7	19,506.9

E – Endangered; OC – Of Concern; NCAP – No Concern at Present; NL – Not Listed



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Datum: GDA94, MGA Zones55



| HANCOCK GALLILEE PTY LTD
Kevin's Corner Project
Environmental Impact Statement

VEGETATION COMMUNITIES ON
THE PROJECT SITE WITH
DISTURBANCE FOOTPRINT OVERLAY

Job Number | 4262 6660
Revision | B
Date | 12-09-2011
Figure: 9-5

File No: 42626660-g-1064.wor

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9.3.2.2 Vegetation Communities on the Project Site within Disturbance Footprint.

The Natural Grasslands of the Central Highlands and northern Fitzroy Basin (RE 11.8.11) is listed as an Endangered Community under the EPBC Act and Of Concern under the VM Act and DERMs Biodiversity Status. Around 13% (22 ha) of the total extent of this RE found on site (predominantly within the transport corridors to the east) will be impacted by surface disturbance from the construction of these corridors. Further impacts may occur as a result of ongoing mining activities.

The Poplar Box Open Woodland (RE 10.3.27a and RE11.3.2) is listed as Of Concern under DERMs Biodiversity Status. The overall condition of this RE on the Project site has been reduced by cattle grazing and weed invasion. Based upon the proposed disturbance footprint, it will lose ~20% of the overall area currently found on site (approximately 175 ha).

The Brigalow Open Woodland (RE 10.4.5 and RE 11.3.5) vegetation communities are listed as Of Concern throughout Queensland under the DERMs Biodiversity Status due to total grazing pressures, in particular pasture degradation and significant loss of groundcover. RE 10.4.5 is outside of the disturbance footprint and will therefore remain intact, however RE 11.3.5 will have nearly 6 hectares impacted or ~16.5% of its total area on site. The Brigalow Open Woodland (RE 10.9.3) is listed as Endangered under the DERM Biodiversity Status yet no surface disturbance is proposed for this community.

The Gidgee Open Woodland (RE 10.3.4) is listed as Of Concern under the DERM Biodiversity Status. This RE comprises a single hectare of vegetation on the Project site which will not be affected by any surface infrastructure.

The two Fringing Riparian Woodlands listed as Of Concern under the DERM Biodiversity Status are both represented within the proposed disturbance footprint. Approximately 150 hectares of RE 10.3.13a and 540 hectares of RE 10.3.14 will be directly impacted as a result of mining construction and operation activities. Importantly, this does not include the impacts caused by proposed creek diversions within the Project site. The direct disturbance constitutes ~25% and ~50% of the total area on site of RE 10.3.13a and 10.3.14 respectively.

The Thozet's Box Open Woodland (RE 10.7.5) is listed as Of Concern under DERMs Biodiversity Status. Approximately 60 hectares of this community will be impacted as a result of mining activities, comprising over 25% of its total extent on site.

9.3.2.3 Residual Impacts

Residual impacts remain after a Project's environmental management strategies, mitigation measures and rehabilitation methods have been carried out. These impacts may not be realised for several decades given the timeframes involved in determining success of rehabilitation efforts. Residual impacts for the Project include removal of vegetation and associated faunal habitat. Of particular importance are those areas of Conservation Significance (including Endangered and Of Concern ecosystems listed under the EPBC Act and the DERM Biodiversity Status) and impacts of the diversions of Sandy and Middle Creeks on its associated Fringing Riparian Woodland (RE 10.3.13a). Where there is residual loss or degradation of vegetation, habitat or land use upon completion of mine decommissioning (or as residual impact is identified prior to decommissioning), further compensation in the form of research or vegetation offsets can be employed.



9.3.2.4 Mitigation Measures

A general principle of environmental management is to, in order of preference:

- Avoid environmental impacts;
- Minimise the impacts;
- Mitigate for impact; and
- Where impact cannot be avoided or minimised, compensation for impacts such as offsets can be used.

Avoiding environmental impacts has been planned for where possible throughout project planning and design phases. There will also be ongoing opportunities to further avoid impacts at a local scale through the detailed design process.

Environmentally sensitive areas (ESA) should be clearly identified and managed in order to avoid, minimise or mitigate potential impacts. ESAs include all patches of remnant vegetation that may provide likely habitat for rare or threatened species, areas rehabilitated as an offset requirement and any non-remnant vegetation incorporated in offsets and buffers to these areas.

These areas should be marked on any maps provided to staff and/ or fenced. No direct disturbance should occur in these areas; such disturbance includes vehicle access.

Strategies to minimise the impacts of the Project upon native flora and recommendations for Project site rehabilitation are provided below.

- Areas of native vegetation requiring removal should be clearly delineated to equipment operators and supervisors before any clearance is conducted to ensure disturbance is minimised. The design, location and construction of such infrastructure will meet the following performance criteria:
 1. Vegetation communities listed as endangered at either the Commonwealth or State level will be affected, where suitable alternatives exist;
 2. Impacts on State-listed vegetation of concern will be minimised wherever possible;
 3. Fragmentation of remnants of vegetation/habitat will be avoided wherever possible;
 4. Disturbance will be located at the edge of existing remnants where possible; and
 5. Where possible, access tracks and other infrastructure will be located in areas that have already been disturbed.
- Clearing of vegetation in Sandy Creek and Well Creek will be minimised to maintain habitat connectivity and provide a movement corridor for small terrestrial fauna species. Whilst this community will be physically fragmented, the actual degree of habitat fragmentation is highly dependent on the mobility of the organism in question (McIntyre and Hobbs, 1999). Disconnected areas may continue to be utilised by some species if kept intact which needs to be considered, however minimising fragmentation will allow more species to utilise the remaining strands of vegetation.
- Clearing of vegetation in EPBC listed threatened communities will be minimised to maintain habitat connectivity. The EPBC listed Threatened Communities Natural Grasslands of the Central Highlands and the northern Fitzroy Basin is located on site. The Endangered community represented as RE 11.8.11 is situated within the proposed transport corridor to the east of Mining



Lease Application (MLA) 70425. Management and rehabilitation of these communities will be addressed in the EM Plan (Volume 2, Appendix W).

- Native vegetation removal is recommended to be conducted only after:
 - clearance from environmental staff has been obtained
 - the areas to be cleared have been clearly delineated and identified to equipment operators and supervisors;
 - It is proposed that in order to ensure disturbance to threatened or other significant flora is minimised, a trained ecologist or other suitably qualified environmental field supervisor will accompany clearing crews when clearing significant vegetation
 - weed control measures such as vehicle wash downs have been implemented to prevent the spread of weed species along riparian corridors;
 - appropriate erosion and sediment-control structures are in place; and
- To maintain the integrity of vegetated land that is not cleared, appropriate erosion and sediment controls are recommended to prevent sediment deposition in remaining habitat. Maintenance of retained areas of existing vegetation would also provide a source of seed for mine rehabilitation works.
- It is recommended that the methodologies for the rehabilitation/re-vegetation works for the Project use the most appropriate native species for the landscape elements of the site. Species chosen for revegetation should be selected from the lists provided in Volume 2, Appendix L1 showing the dominant flora of each community. Seed collection from impacted areas prior to topsoil removal will ensure that local adaptations are incorporated into the post-mining rehabilitation landscape. Exotic pasture species may only be used where possible invasion into uncleared land or rehabilitated natural areas is monitored and controlled. Buffer zones of native pasture species may be required.
- Areas such as the overburden emplacement should be assessed for species establishment using revegetation trials to ensure long-term stability and rehabilitation success rather than quick fixes that may not be successful in the long term.
- It is recommended that sections of the Fringing Riparian Woodland (RE 10.3.13a and 10.3.14) communities are fenced off from stock. This is particularly important for areas that still include a good coverage of native species, as well as areas that are heavily infested with weeds unpalatable to stock. Fencing these Of Concern communities will assist in maintaining and improving native groundcover species, as well as preventing the spread of weed seeds and assist in erosion control. In contrast, for areas of buffel grass infestation, controlled grazing has proved to be the most effective method of keeping this weed under control.
- It is recommended that recreated landforms are contoured to resemble the original local topography, and be re-contoured as a flat to undulating plain where practical. Flora species included in rehabilitation should be chosen with the aim to resemble pre-mine condition of vegetation communities.
- A segment of the Staff Induction Program will be allocated to informing staff of the conservation values on the Project site and surrounding areas to increase staff awareness of the species present. This will include photographs, brief descriptions and management requirements of native species.



- A rehabilitation strategy will be developed for the Project site. This strategy will embody the concepts and recommendations presented above and include provision for monitoring of rehabilitation progress over the life of the operation.

9.3.2.5 Off-Park Conservation and Incentives

Many of the vegetation communities have little representation within National Parks. The State government, (through DERM), has developed Nature Conservation Agreements that are linked to the deed title of a property. Land for Wildlife has been developed in association with local government bodies to give some incentive to landholders through recognition and education to develop a natural resource management plan for some or all of their property.

Habitat protection within reserves and on private lands has been deemed the most important recovery action for ecosystems within the Desert Uplands Bioregion (Bioregion 10) (Mitchell et al., 2002). Appropriate management of fire regimes and research were the next most commonly stated recovery actions.

9.3.2.6 Management Strategies for Non-native Flora Species

Weeds pose a significant threat to Australia's natural ecosystems. Extensive invasions can change the floristic structure of vegetation and upset the ecological balance in affected communities as they compete for space and resources with native species. Controlling declared pests and protecting ecosystems from threatening processes such as the invasion of noxious weeds is a legal obligation. Prevention and early detection of weed outbreaks are the most cost effective strategies for dealing with weeds as eradication of large infestations can be difficult and often requires greater resources.

Mined lands are prone to weed invasion, particularly where soils have been disturbed, along transport routes and surrounding infrastructure areas. The risks posed by weeds in mining areas include the introduction of new species, the spread of weeds to adjacent areas and increases in weed abundance in disturbed areas. Weeds can also diminish rehabilitation efforts by outcompeting species selected for revegetation and reduce overall land productivity.

A number of weed management strategies are recommended to minimise the potential of future weed infestations. These should be adopted for all stages of mine activity including construction, operation and rehabilitation:

- The present location of weeds should be highlighted and a comprehensive weed spraying program be implemented prior to the commencement of works. Declared weed species will be treated as per the relevant Department of Employment, Economic Development and Innovation (DEEDI) fact sheet for each particular species.
- Monitoring in the form of annual observations by site personnel for weeds of management concern should be undertaken. These should be conducted following significant rain events in the wet season particularly in disturbed areas, roadsides, riparian zones and wash down facilities.
- Wash down facilities should be constructed at access points for vehicles arriving and departing from the Project site. These facilities should be bunded and located away from drainage lines to minimise the risk of weed spread.



- All vehicles entering the Project site and leaving properties known to contain declared weeds should be thoroughly washed down before entering clean areas; ensuring wheels, wheel arches and the undercarriage are free of mud and plant material.
- Vehicles should keep to roads or compacted surfaces (preventative), and reduce vehicle movements in wetted soil areas where avoidance is unavoidable.
- Radiators, grills and vehicle interiors should be cleaned for accumulated seed and plant material.
- All materials should be certified by a qualified person as weed free prior to acceptance on-site.
- Soil and fill material from weed affected areas should not be transported to clean sites. Minimising soil disturbance will limit the ability of weeds to become established.
- If weeds of management concern are identified, they should be controlled on site in accordance with local best management practice from the Jericho Shire Pest Management Plan and/or the DEEDI Pest Fact sheets.
- Observations of treated areas to assess the success of declared weed eradication should be undertaken.
- To promote the awareness of weed management issues, it is recommended that weed management is included in the Site Induction Program for the Project.
- Prepare a site-specific Weed and Pest Management Plan (WMP). The WMP is to describe how the weeds are to be managed in accordance with the LP Act and / or the local government requirements for weeds not declared under State legislation.

9.3.2.7 Rehabilitation of Disturbed Areas

Progressive rehabilitation of disturbed areas following the construction and operation phases will be performed where possible. The initial focus of rehabilitation should be soil erosion and sediment control measures and will involve the implementation of physical controls as outlined in the Environmental Management Plan (EM Plan) (Volume 2, Appendix W). Following stabilisation of the site, the focus of revegetation should aim to enhance the suitability of the site for wildlife (within operational safety bounds); however, some areas will be rehabilitated to pastures per the existing land use.

Revegetation of the areas should include:

- Planting of a range of native shrubs, trees and groundcover plants from locally-sourced seed;
- Inclusion of logs, dead trees and stumps sourced from cleared areas in the landscaping / rehabilitation works;
- Linking of vegetation remnants;
- Focusing on riparian vegetation to protect waterways;
- Maintenance of rehabilitation through a rehabilitation monitoring plan; and
- Management of weeds and pest animals through a pest management plan.

Species chosen for rehabilitation should be locally indigenous and match soil type and land forms. The ground layer should be well established to provide habitat and forage for fauna and aid in restoring ecosystem processes. The shape of rehabilitated areas should have a larger width, to reduce edge



effects. Positioning of the rehabilitated area should aim to increase opportunity for re-colonisation of plant species, build on the existing natural vegetation and provide a sanctuary away from known sources of mine disturbance.

Monitoring of rehabilitated areas should be ongoing until the completion criteria have been met for the entire area of disturbance. Monitoring of rehabilitated and vegetation reference sites should provide statistically valid results, to show completion criteria have been met. This monitoring should also highlight areas that need further attention (eroded areas, areas requiring further seeding efforts, etc.). Monitoring should occur on an annual basis. Vegetation reference sites are used to create a comparable benchmark for rehabilitated sites to determine rehabilitative success. Vegetation reference sites should be chosen based on being representative of the respective land disturbances such as topography, soil characteristics and vegetation type and structure. Reference sites and rehabilitated sites should be assessed for quantitative data using photo points and field survey techniques. Useful additional information also includes the following:

- Plant and litter cover;
- Plant density and species composition;
- Presence and abundance of weeds; and
- Soil erosion.

9.3.2.8 Required Offsets

The discovery on site of a listed Threatened Ecological Community (RE 11.8.11 - Endangered natural grasslands of the Queensland central highlands and northern Fitzroy basin) will, under the EPBC Act, require the use of environmental offsets as detailed within the draft policy *Use of Environmental Offsets under the Environmental Protection and Biodiversity Conservation Act 1999* statement (DEWR 2007). . Guidelines for the use of vegetation offsets are detailed below in Section 9.1.3.2 (Vegetation Management Offsets).

Offsets under the EPBC Act

The purpose of the draft policy *Use of Environmental Offsets under the Environment Protection and Biodiversity Conservation Act 1999* (DEWR 2007) is to outline the Commonwealth Governments position on the use of environmental offsets under the EPBC Act. Environmental offsets can be used under the EPBC Act to maintain or enhance the health, diversity and productivity of the environment as it relates to matters protected by the EPBC Act.

Environmental offsets can be applied as an approval condition under the EPBC Act for developments that have undergone assessment. They may be used when a development will result in impacts on a matter protected by the EPBC Act; however, environmental offsets are not applicable to all approvals under the EPBC Act. Offsets should not be applied where the impacts of a development are considered to be minor in nature or could reasonably be mitigated. In some circumstances suitable offsets may not be available to adequately compensate for the impacts of a development and a decision on the overall acceptability of the Project will need to be made.

Eight principles have been identified by the Commonwealth Government for the use of environmental offsets under the EPBC Act. These principles are used in assessment of any proposed environmental offsets and include the following components:



- Environmental offsets should be targeted to the matter protected by the EPBC Act that is being impacted.
- A flexible approach should be taken to the design and use of environmental offsets to achieve long-term and certain conservation outcomes which are cost effective for proponents.
- Environmental offsets should deliver a real conservation outcome.
- Environmental offsets should be developed as a package of actions - which may include both direct and indirect offsets.
- Environmental offsets should, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are like for like.
- Environmental offsets should be located within the same general area as the development activity.
- Environmental offsets should be delivered in a timely manner and be long lasting.
- Environmental offsets should be enforceable, monitored and audited.

The requirement for environmental offsets as stated under the EPBC Act has been triggered by the discovery of RE 11.8.11; a constituent of the Endangered Ecological Community Natural grasslands of the Queensland central highlands and northern Fitzroy basin.. Guidelines for implementing these offsets can be taken from the VM Acts *Policy for vegetation management offsets* described below.

Vegetation Management Offsets

The *Policy for Vegetation Management Offsets* applies to an offset proposed to meet a performance requirement in an applicable VMA code and is administered by DERM. This policy is applicable for any RE listed as Endangered, Of Concern, Essential Habitat, Natural Wetland or vegetation associated with watercourses under the VMA Vegetation Management Status.

The policy is enacted by the VM Act. As the VM Act is not applicable to areas within the Project lease (VM Act does not apply to mining projects as is legislated within the *Sustainable Planning Regulation 2009*) the Policy for Vegetation Management Offsets also does not apply to areas within the Project lease. However, the policy does apply to off-lease road access, power, water and rail corridors and also provides a useful guideline to propose offsets triggered under the EPBC Act as well as voluntary vegetation offsets for the Project.

A vegetation management offset is an arrangement or agreement that, over time, guarantees to maintain the extent, structure and function of:

- Regional ecosystems;
- Essential habitat; and
- Vegetation associated with
 - Watercourses;
 - Natural wetlands; and
 - Natural significant wetlands.

Associated offsets can be used to compliment vegetation management offsets and may include, but are not limited to:



- Fencing off areas of these REs on the Project site to limit access of stock;
- Adopting an area of remnant vegetation with the same or better ecological quality with a valid clearing approval (therefore would otherwise be cleared); or
- Adopting a non-remnant vegetation community (or remnant community exempt from protection), which has the same pre-clearing regional ecosystem and, with management, attaining remnant or protection status within 5 years.

A vegetation offsets management strategy has been produced for the Project (refer to EIS Volume 2, Appendix Z for details), which provides an overview of the approach that will be adopted, in order to establish and meet Hancock's obligations as a result of the Project. Environmental offsets have been considered as part of the EIS and in the development of the EMP, where there may be a remaining environmental impact.

Although the following REs (with a DERM Biodiversity Status of "Endangered" or "Of Concern") were recorded on the Project site and may be disturbed vegetation offsets, are not required for these REs, because the VM Act does not apply to habitats within the mining lease:

- Brigalow Open Woodland RE 11.3.5 (5.7 Ha disturbed);
- Fringing Riparian Woodland RE 10.3.13a and 10.3.14 (688.0 ha disturbed);
- Poplar Box Open Woodland RE 10.3.27a (174.3 ha disturbed);
- Thozets Box Woodland RE 10.7.5 (62.3 ha disturbed); and
- Poplar Box Open Woodland RE 11.3.2 (4.5 ha disturbed).

9.4 Terrestrial Fauna

9.4.1 Description of Environmental Values

Fauna surveys were conducted during the wet and dry seasons to account for seasonal variation in species diversity and abundance. Environmental variations due to recognised dry and wet seasons may include differences in water availability, changes in habitat values and changes in floristic composition. Seasonal studies ensure that migratory and transient fauna responsive to particular environmental conditions are captured, when seasonally or intermittently inhabiting the Project site. Seasonal variation in both species diversities and abundances is commonly observed in Central Queensland.

The entire AARC 2011 Flora and Fauna Assessment report is provided in Volume 2, Appendix L1, whilst extracts from the Fauna Assessment are present hereafter.

9.4.1.1 Methodology

The fauna sampling methodology for the Project site was conducted using various methods to comprehensively sample the terrestrial and aquatic vertebrate fauna found on site. Sampling of fauna was conducted across the site to adequately represent the different vegetation communities found within the Project boundary.

At each of the trapping sites the following survey methods were used:

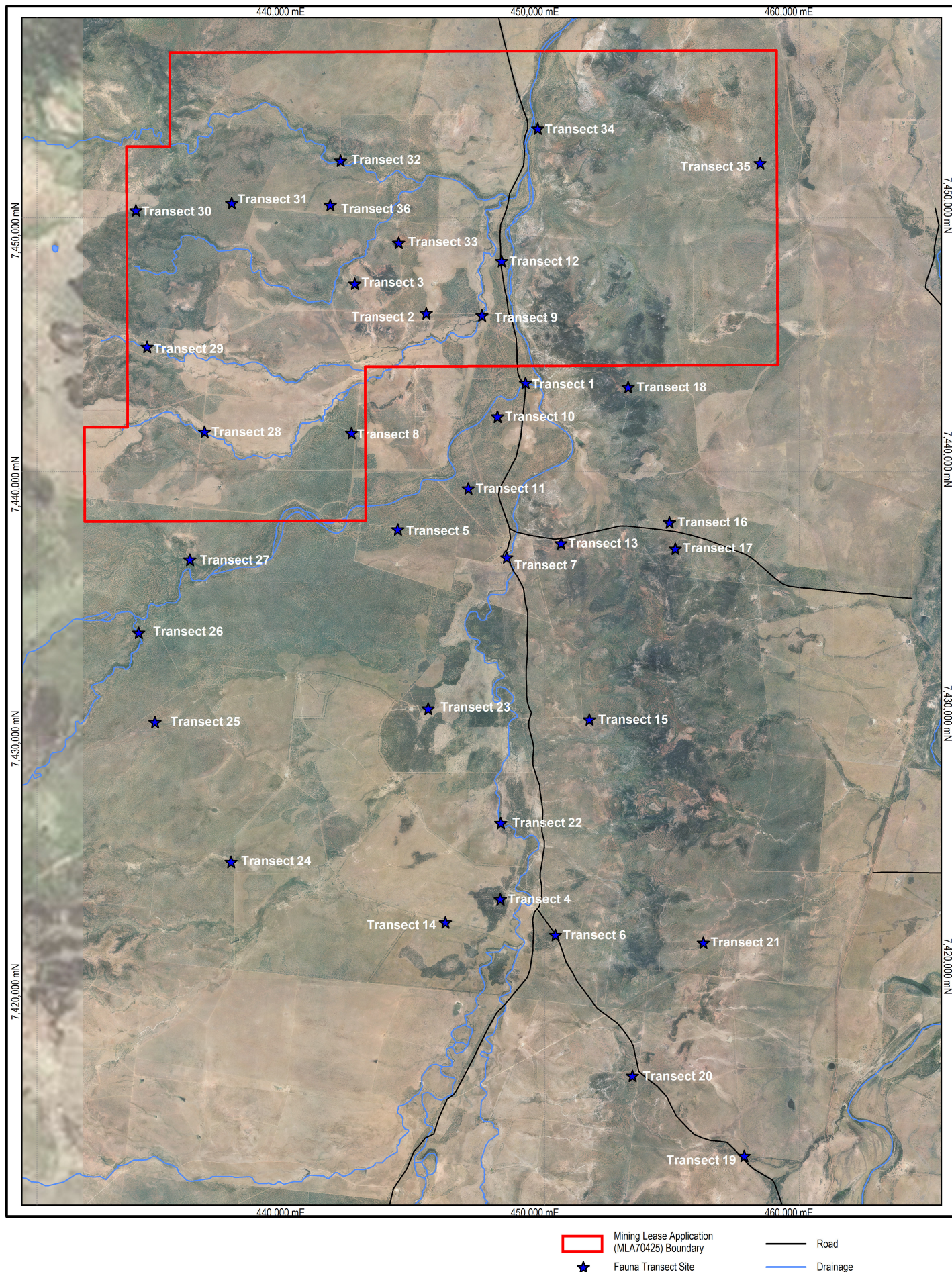


- Scats and tracks searches;
- Habitat assessment;
- Pitfall trapping;
- Elliott trapping;
- Ultrasonic bat detection (AnaBat™);
- Funnel trapping;
- Motion sensor cameras;
- Spotlighting; and
- Active searching.

A total of 36 fauna transect sites were established on and surrounding the Project site. Each site was subject to trapping regimes of up to four consecutive nights for pitfall traps and five consecutive nights for all other traps. The location of these fauna transects are presented in Figure 9-6 below and include both the Project site and surrounding habitat.

Fauna transects were established across the range of vegetation communities present on the Project site. Fauna transect sites outside the Project area were also utilised in this fauna assessment, as habitat types are synonymous with those found on the Project site. Also, most fauna species identified have the mobility to inhabit the Project's MLA. A combination of pitfall lines, funnel, cage, Elliot traps and AnaBat™ recordings were used to assess the presence and abundance of species at these locations. Active searching and bird surveys were undertaken to supplement data from the transect sites.

Transects were positioned to maximise the potential for sampling all wildlife present by targeting the full range of habitat types present on and surrounding the Project site.



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Datum: GDA94, MGA Zone55



FAUNA TRANSECT SITES ON AND ADJACENT TO THE PROJECT SITE

Job Number | 4262 6660
Revision | B
Date | 12-09-2011

Figure: 9-6

File No: 42626660-g-1065.wor

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9.4.1.2 Results and Discussion

A total of 163 vertebrate fauna species were identified on the Project site during the surveys. This comprised 92 birds, 35 mammals (four introduced), 26 reptiles and 10 amphibians (one introduced).

Amphibians

Due to the ephemeral nature of the creeks at the Project site, only stock watering points and two permanent water holes within creeks provided amphibian habitat during the dry season surveys. Conversely the wet season provided a range of varying habitat types for amphibians, and included flowing creeks, and moist sandy drainage lines. Creeks on the Project site contained a sandy substrate and were soft enough for burrowing frogs.

Ten amphibian species were observed on the Project site. The most frequently captured species was the ornate burrowing frog (*Platyplectrum ornatus*), with captures at some trap sites exceeding 50 individuals per night. The green tree frog (*Litoria caerulea*) and desert tree frog (*Litoria rubella*) were frequently seen while spotlighting during the wet season. Four additional *Litoria* spp. were trapped during the wet season. Other amphibian species observed during the wet season include the spotted marsh frog (*tasmaniensis*), eastern burrowing toadlet (*Uperoleia rugosa*) and the introduced cane toad (*Rhinella marina*).

No amphibians of conservation significance were observed on the Project site during the wet and dry season survey periods despite an extensive trapping effort and favourable conditions, nor have been previously recorded within the region. It is therefore considered highly unlikely that any amphibian species of conservation significance occur on the Project site.

Birds

Food sources within the Project site included a variety of grass seeds, nectar, insects and vertebrate prey items. Soft fruiting species suitable for birds do not occur in high densities within the Project site; however habitat complexity is relatively high across the site and includes 23 unique vegetation communities.

A total of 92 bird species were recorded within the Project site during the surveys of which 24 are listed as Migratory or Marine under the EPBC Act.

The most commonly observed granivorous bird species observed were the zebra finch (*Taeniopygia guttata*), double-barred finch (*Taeniopygia bichenovii*), peaceful dove (*Geopelia striata*) and galah (*Eolophus roseicapilla*). The diversity of granivorous birds observed on the Project site is not uncommon within the region.

Many bird species were observed using watercourses located within the Project site. Species using these dams and other bodies of standing water include the straw-necked Ibis (*Threskiornis spinicollis*), nankeen night heron (*Nycticorax caledonicus*), great egret (*Ardea alba*), darter (*Anhinga melanogaster*), brolga (*Grus rubicunda*), Australian pelican (*Pelecanus conspicillatus*) and the white-necked heron (*Ardea pacifica*).

Six raptor species were identified during the course of the survey. These were the wedge-tailed eagle (*Aquila audax*), brown falcon (*Falco berigora*), whistling kite (*Haliastur sphenurus*), black-shouldered kite (*Elanus axillaris*), Australian hobby (*Falco longipennis*) and nankeen kestrel (*Falco cenchroides*).



The most common types of birds encountered were insectivorous, and included such species as the Australian magpie (*Gymnorhina tibicen*), the willy wagtail (*Rhipidura leucophrys*), the apostle bird (*Struthidea cinerea*), and the superb fairy-wren (*Malurus cyaneus*). The wide array and abundance observed in these birds is due to the readily available prey, and their ability to colonise all available habitats. An omnivorous bird commonly observed on all vegetation communities within the Project site was the emu (*Dromaius novaehollandiae*). A full species list is provided in Volume 2, Appendix L1.

The southern squatter pigeon (*Geophaps scripta scripta*) was the only bird species of conservation significance recorded during the survey, with individuals observed within non-remnant grassland habitat. This species is listed as Vulnerable under both the EPBC Act and Schedule 3 of the Queensland *Nature Conservation (Wildlife) Regulation 1994* (NCWR). Threats to this species include overgrazing of habitat by domestic stock and the European Rabbit, trampling of nests by domestic stock, predation by feral cats and foxes, illegal shooting and clearing and fragmentation of grassy woodland habitat for agriculture and development (Department of Environment and Conservation, 2009). Extensive areas of habitat suitable for the southern Squatter Pigeon exist on the Project site, and within the local region. Although it is likely some of the available Squatter Pigeon habitat will be disturbed by mining activities, it is unlikely that there will be a significant impact on the regional population of the species due to the broad extent of habitat.

Two Migratory species listed under the EPBC Act were observed on the Project site during all survey periods. These included the great egret (*Ardea alba*), and the rainbow bee-eater (*Merops ornatus*). The distribution of these species is widespread throughout eastern Queensland, and the local populations on the Project site are considered unlikely to constitute an ecologically significant proportion of the total population of the species. Furthermore, the Project site is not at the limit of these species range, nor are these species considered to be declining within the region. Therefore, it is unlikely the Project will have a significant impact on the regional populations of these species.

Fifteen Marine species listed under the EPBC Act were also observed on the Project site, including the black-faced cuckoo-shrike (*Coracina novaehollandiae*), spotted nightjar (*Eurostopodus argus*), forest kingfisher (*Todiramphus macleayi*) and sacred kingfisher (*Todiramphus sanctus*). These species are also widespread throughout eastern Queensland and given the availability of similar habitat in the region it is unlikely the Project will have any significant impacts upon them.

Reptiles

The Project site provides a variety of micro-habitat types suitable for reptile species occurring in the region. These include soil cracks in the grasslands, tree hollows, fallen timber and creek banks and mature overstorey species in riparian woodlands.

A total of 26 reptile species were observed on the Projects Site. Many of these are nocturnal and were observed while spotlighting or captured in pit and funnel traps. Species encountered during the day were the sand goanna (*Varanus gouldii*), central netted dragon (*Ctenophorus nuchalis*), black headed python (*Aspidites melanocephalus*), eastern blue-tongue (*Tiliqua scincoides*), tommy roundhead dragon (*Diporiphora australis*) and nobbi dragon (*Amphibolurus nobbi*). Other snake species observed were the spotted python (*Antaresia maculosa*), carpentaria whip snake (*Cryptophis boschmai*) and pale-headed snake (*Holocephalus bitorquatus*). Eight skink species were observed on the Project site, with *Ctenotus robustus* and *Ctenotus herberti* the most abundant. Bynoe's gecko (*Heteronotia binoei*) and *Geyhra variegata* were the most frequently encountered gecko species during the surveys. Lower



abundances of reptile species during the dry seasons were noted, and are likely due to the dry, cool weather. A complete list of the recorded reptiles is included in Volume 2, Appendix L1.

No reptiles of conservation significance were recorded on the Project site at the time of the surveys.

Mammals

A total of 35 mammal species were identified within the Project site, including four introduced species and one bat species of conservation significance under State and Commonwealth legislation.

The morphology of mammal species varies widely from small rodents to larger kangaroos and bats. The ecology of each of these groups is equally variable and they are assessed separately in the following sections.

Small Mammals

Habitats within the Project site ranged from open woodland with adequate groundcover in the form of grasses, to non-remnant grassland with dense groundcover. Other habitat available on the Project site includes riparian woodlands and human structure such as stations and the mine accommodation village. Native mammals in this category include the stripe-faced dunnart (*Sminthopsis macroura*) and the echidna (*Tachyglossus aculeatus*). Exotic species included the commonly observed European rabbit (*Oryctolagus cuniculus*).

Medium and Large Mammals

The most common species to occur on the Project site were medium to large sized mammals including the Eastern Grey Kangaroo (*Macropus giganteus*), Common Wallaroo (*Macropus robustus*), Rufous Bettong (*Aepyprymnus rufescens*) and Red Kangaroo (*Macropus rufus*). Habitat for this group on the Project site commonly occurs throughout the region including open woodland and non-remnant grasslands. Larger mammals such as kangaroos have been much less affected by predation and land clearing activities and have subsequently flourished in response to increasing grasslands. Their populations are now likely to be above historical levels.

Arboreal Mammals

Large hollow-bearing trees in the broader area generally occur along creek lines or in small pockets of remnant vegetation and are usually scattered, separated by open areas that would be difficult for arboreal mammals to cross without venturing onto the ground. It is likely that such habitat is too open for many arboreal mammals and very few are known to occur within the broader region. This was reflected in the low numbers of observed arboreal mammals during the surveys that included the sugar glider (*Petaurus breviceps*) and koala (*Phascolarctos cinereus*).

Bats

Areas with a large number of hollow-bearing trees that occur within remnant vegetation are of high value to many bat species. As many bats have a small body size, these hollows can be much smaller in size than required by most arboreal mammals. Suitable hollows were present within the Project site, including larger senescing trees in the woodlands. The riparian areas are of particular importance as they include many hollow-bearing trees and provide a source of fresh water that are a common habitat type on site (over 2,000 ha of Fringing Riparian Woodland). Nine microbat species have been positively identified from echolocation calls recorded on the Project site including the Beccari's Free-tailed Bat (*Mormopterus beccarii*) and the White-striped Free-tailed Bat (*Tadarida australis*).



9.4.2 Summary of Environmental Values

The faunal environmental values that are associated with the Project site include the following:

- Suitable habitat for threatened species. Fallen timber within the Brigalow Open Woodland and Gidgee Open Woodland has the potential to provide a distinct microhabitat for certain fauna, including the listed yakka skink (*Egernia rugosa*) and brigalow scaly-foot (*Paradelma orientalis*). A permanent water source with open woodland and surrounding grassland has the potential to provide habitat for the star finch (*Neochmia ruficauda ruficauda*) and black-throated finch (*Poephila cincta cincta*);
- Small and medium sized mammals are well represented on the Project site. The abundance of these species is low, which is normal due to the decline in native mammals within this weight range following the introduction of pest fauna such as the feral cat (*Felis catus*), dingo (*Canis lupus dingo*) and red fox (*Vulpes vulpes*); and
- The avian species recorded on the Project site are mostly typical woodland birds and represent a healthy population and diversity of species within the region.

9.4.3 Potential Impacts and Mitigation Measures

The following sections discuss potential impacts of the Project upon faunal habitat and species, as well as impact mitigation strategies that should be employed during both the construction and operation phases of the Project.

9.4.3.1 Potential Impacts

The construction of mine infrastructure has the potential to affect fauna populations through habitat loss, population isolation, edge and barrier effects and an increase in mortality from mine activities and increased road traffic. The development of mine infrastructure will involve landscape modification procedures through vegetation clearing, recognised as a threat that can affect different taxa in differing ways.

Given that habitat within the Project site houses large, predominantly undisturbed tracts of remnant woodland, it provides a high degree of connectivity between the surrounding landscapes. This is particularly pertinent when considering that the Cudmore Resources Reserve occupies a section to the north-west of the Project site. Well Creek and Sandy Creek are also important linear habitat corridors which traverse the Project, with the riverine habitat on site providing shaded shelter, nesting habitat and a water source for fauna species.

The species that are most vulnerable to a decline in genetic diversity are those which are habitat-specific and those which are low mobility species (where even a small reduction in mobility can reduce genetic continuity within a population, hence reducing the effective population size). Species least vulnerable to a decline in genetic diversity are those which are highly mobile, including birds and larger mammals, although even these species can vary in their response to habitat fragmentation. Low mobility species, such as smaller reptiles and amphibians, utilising the Project site have the potential to become genetically isolated. This occurs when individuals from a population within one fragment are unable to interbreed with individuals from populations in adjoining fragments.

Artificial lighting can affect both nocturnal and diurnal animals, because it disrupts light-induced activity patterns. The effect of artificial lighting varies with different species. The presence of predator species



that feed upon insects attracted by light was observed at both the accommodation village and the mining operation during the field surveys. The illumination of bat-roosting habitats can influence emergence activity (Swift, 1980), whilst higher light intensities can impact frog behaviour (Baker and Richardson, 2006). The Project will significantly increase the light intensity in affected areas; however, these lights will not be directed into neighbouring natural areas or riparian habitat, thus increases in overall levels of illumination for these habitats will be minimal. Significant impacts upon the local fauna as a result of increased levels of illumination are therefore not anticipated.

For riparian woodlands downstream of the proposed mine site, changes in stream flow patterns can result in increased levels of stream erosion and thus elevated concentrations of suspended sediment. Higher levels of erosion can lead to a loss of morphological diversity in streams and subsequently affect habitat quality and biodiversity (Schwendel *et al.*, 2011).

Land clearing and mining activities may reduce the available breeding and foraging habitat, and will result in a localised reduction in the amount of roost and nesting sites, microhabitats and potential foraging areas for many fauna species. For example, clearing would add population pressure to resident bats in these adjacent areas through an increase in competition for roost sites, mates and food resources and may potentially lead to a decrease in population viability.

Additional potential impacts on fauna populations may result from the proposed Project works. These impacts include:

- Increased risk of fauna mortality resulting from vehicle strike and the destruction of tree hollows;
- Disruption of species behaviour;
- Increased habitat fragmentation and loss of connectivity across the mine infrastructure and pit areas;
- Reduction in the extent of riparian habitats and habitat fragmentation due to direct loss of vegetation and the proposed Sandy and Middle Creek diversions;
- Increase in noise, vibration and dust associated with the construction and operational phases of the Project may lead to the displacement of native species from their current home ranges;
- Increase in the number of introduced fauna species that utilise the Project site such as the cane toad, feral pig, European rabbit, house mouse and feral goat;
- Mine-related infrastructure such as sediment dams may be accessible to fauna and act as additional water sources; and
- Certain species, including the Southern Squatter Pigeon, will be positively impacted by the rehabilitation process as it will provide grassland habitat that is not dominated by buffel grass (*Cenchrus ciliaris*) and cattle. However, this may not eventuate if desired end point of rehabilitation is grazing land.

All of the EPBC Act migratory and marine listed species that were observed on the Project site exhibit a wide distribution across eastern Queensland. Therefore, local populations of each species are unlikely to constitute an ecologically significant proportion of the total population of the species. Furthermore, the Project site is not at the limit of these species range, nor are these species considered to be declining within the region. Therefore, it is unlikely the Project will have a significant impact on the regional populations, breeding patterns, feeding patterns and normal movements of these species.



9.4.3.2 Potential Impacts on Fauna of Conservation Significance

One species of conservation significance, the Southern Squatter Pigeon, was identified within the Project site. The following points describe direct and indirect impacts on this species.

Direct impacts

- Loss of roost sites due to vegetation clearing.
- Loss of foraging habitat due to vegetation clearing.
- Direct disruption of breeding and weaning behaviour associated with the timing of vegetation clearing as well as via vibrations from blasting activities.
- Direct mortality of individuals from clearing activities.
- Direct mortality of individuals from machinery and quarrying activities.
- Degradation of fauna habitat due to the spread of weeds and pests, rubbish from mine site areas and pollution associated with noise, vibration, dust and light.
- Increase in blasting, noise, dust and vibration during construction and operational activities which may discourage the Southern Squatter Pigeon from utilising the immediate area. These impacts may also affect insect abundance, water quality and reproductive behaviour.

Secondary (indirect) impacts

- Degradation of habitat values in adjacent and remaining habitats through edge effects and the disruption of habitat connectivity.
- Possible restriction of fauna movements within adjacent wildlife corridors including the Cudmore Resource Reserve.
- Indirect impact to breeding and feeding activities through noise, dust, vibration and light disturbance.
- Introduction of pests and predators and spread of weed infestations.

9.4.3.3 Cumulative Impacts

The potential ecological impacts identified above are considered as a consequence of the construction and operation of the Project. The incremental effect of multiple sources of impact (past, present and future) is referred to as cumulative impacts (Contant and Wiggins, 1991). These impacts may become exacerbated over time. Consideration of cumulative impacts is necessary so impacts associated with the Project can be assessed with additional regional impacts from external sources.

Potential regional developments that may interact with the construction of the Project include:

- Other mines operations in the region, including the Alpha Coal Project;
- The coal transport corridor for the Project;
- The proposed water sources for the Project; and
- Low intensity stock graziers, which may be affected by the Project.

All such developments are likely to contribute to a greater extent of ecological pressures on habitat and flora/fauna, such as vegetation clearing and further fragmentation of habitat.



9.4.3.4 Mitigation Measures

Every effort should be made to keep proposed disturbance areas to a minimum in order to retain the intrinsic value of the local ecological habitat. Recommended strategies to minimise the impacts of the Project upon native fauna are provided below.

- Vegetation clearance along watercourses, both ephemeral and perennial in nature, will be minimised in order to maintain habitat connectivity and provide a movement corridor for small terrestrial fauna species and a habitat refuge for fauna seeking shelter and water;
- Clearance from environmental staff will have to be obtained prior to disturbance. If accidental injuries should occur, the methodologies to assess and handle injuries will be directed by environmental staff or other suitability qualified persons;
- Native vegetation removal will be conducted only after the areas to be cleared have been clearly delineated and identified to equipment operators and supervisors;
- It is proposed that care will be taken to minimise harm to affected fauna communities by employing a qualified fauna spotter/catcher. These spotters will have the role of inspecting vegetation prior to clearing in order to ascertain whether or not any fauna is present. If fauna is present, the individual or group concerned should be provided with the opportunity to move on before clearing occurs;
- A trained ecologist or other suitably qualified environmental field supervisor should precede or accompany clearing crews when clearing significant vegetation, in order to ensure disturbance to rare, threatened or other significant fauna is minimised. The trained ecologist or equivalent would actively search for and relocate threatened ground fauna (such as the brigalow scaly-foot (*Paradelma orientalis*) and Dunmall's snake (*Furina dunmalli*) and monitor fauna fleeing the clearing zone to minimise direct mortalities.
- Project persons operating vehicles in and adjacent to the Project site will be made aware of the presence of this threatened species and the potential for it to be encountered on vehicle tracks.
- The Project will probably significantly increase the light intensity in affected areas; however, these lights should not be directed into surrounding natural areas or habitat, thus increases in overall levels of illumination for these habitats will be minimal, i.e. should not provide disturbance or interruption;
- In order to maintain the integrity of vegetated land that is not cleared, appropriate erosion and sediment controls will be implemented in order to prevent sediment erosion or deposition in uncleared habitat. The potential loss of watercourse diversity that is caused by excess erosion or deposition will lead to a decrease in the complexity and availability of particular habitats; and
- Prepare a site-specific Pest Management Plan (PMP). The PMP should describe how the pests are to be managed in accordance with the appropriate legislation.

9.4.3.5 Management Strategies for Species of Conservational Significance

Specific management strategies have been identified for species of conservational significance. A species management plan will be developed for both Conservation Significant species found on site.

**Squatter Pigeon (Southern Subspecies)**

The Southern Squatter Pigeon was recorded during the surveys, with approximately 30 individuals observed in Non-remnant Grassland habitat within the Project site. This species is listed as Vulnerable under both the EPBC Act and Schedule 3 of the NCWR.

Mitigation measures for this species are proposed to include:

- Taking care to ensure no mortality occurs due to vehicle strike. The behavioural characteristics of this pigeon tends to make it vulnerable to such accidents in that it is known to squat and remain motionless in an attempt to go unnoticed instead of fleeing like the majority of other birds. This species has commonly been observed on tracks and roadways and in areas of vehicle activity. Persons operating vehicles in and adjacent to the Project site should be made aware of the presence of this threatened species and the potential for it to be encountered on vehicle tracks;
- A thorough survey of the site by fauna spotters prior to any vegetation clearing to determine the location of any squatter pigeon nests. Particular attention should be given to areas of short dry grass, grass tussocks and under bushes and fallen logs. If nests are located, translocation of the eggs/young should be conducted by qualified personnel to a suitable nearby habitat;
- Control of pest species, such as the European Rabbit and Feral Goat in areas known to be foraging habitat; and pests such as the Feral Cat in areas where the Southern Squatter Pigeon is known to flock; and
- Awareness raising campaign through staff induction programs to include photos, descriptions and preferred habitat of the species.

Little Pied Bat (*Chalinolobus picatus*)

The identification of the Little Pied Bat in habitat within 25 km of the Project site, coupled with the bats large home range (sometimes over 30 km travel per night [Van Dyk and Strahan, 2008]) and existence of suitable habitat on site, suggests that mitigation strategies should be employed for this species during construction and mining activities. Mitigation strategies developed by the Australasian Bat Society should be employed during vegetation clearing and includes:

- A survey of trees prior to clearing to identify and flag potential roost hollows;
- Roost trees and dead stag trees of the Little Pied Bat (*Chalinolobus picatus*) should be preserved where practical (in their entirety or in part) and if possible, the population of this species monitored prior to vegetation clearance;
- Staggered clearing effort to retain hollow trees for 2-3 days after initial clearing to disturb bats and encourage dispersal;
- Careful removal of hollow trees to allow fauna spotter/catcher to relocate trapped individuals;
- After clearing operations have occurred, the salvaging of felled trees containing good hollows for placement away from areas to be cleared;

A more detailed description of these strategies is available from the Australasian Bat Society Newsletter Archive (www.batcall.csu.edu.au/abs/absmain.htm) and includes further mitigation methods such as artificial habitat creation and ongoing monitoring programs.



9.4.3.6 Management Strategies for Pest Fauna Species

Strategies to control pest fauna species will be included in the Pest Management Plan (PMP). Pest management strategies for the Project site should incorporate strategies from DEEDI Pest Fact Sheets and the Burdekin Dry Tropics Regional Pest Management Strategy – Draft for Public Consultation (Maunsell Australia Pty Ltd, 2008).

Feral Pig (*Sus scrofa*)

The feral pig is one of the most widespread and damaging pest animals in Queensland. They favour environments with permanent water bodies and have the potential to cause widespread ecological damage by spreading weeds and disease and spoiling riparian areas. They are listed as Class 2 pests under LP Act. Feral pigs were observed by stock watering dams located in non-remnant grasslands and in watercourses on the Project site. Control methods may include trapping, fencing and possibly poisoning treatments applied by external contractors.

European Rabbit (*Oryctolagus cuniculus*)

European rabbits are a major agricultural and environmental pest in Australia. They compete for food with native animals, are a leading cause of soil loss and can cause the silting up of aquatic ecosystems. European rabbits are listed as a Class 2 Pest under Queensland's LP Act. Favourable habitat conditions and food availability are likely reasons behind their prevalence throughout the Project site where they were observed in abundance.

Under the LP Act, land managers must take reasonable steps to control numbers of Class 2 Pests on their land. It is recommended that a pest management plan be developed to control pest fauna on the Project site.

Feral Goat (*Capra hircus*)

Feral goats are widespread throughout Australia with approximately 10% living in Queensland (DEEDI, 2007). They are a declared Class 2 Pest under the LP Act and landholders are required to take actions to control their numbers. Some of the environmental impacts caused by feral goat populations include overgrazing, increased soils erosion and land degradation. Their selective feeding can alter the floristic composition of plant communities and lead to reduced species diversity as preferred plants can be lost from communities in relatively short periods.

Fact sheets outlining the ecology and control methods of the species described above are attached in Volume 2, Appendix L1.

House Mouse (*Mus musculus*)

House mice are introduced pests that are now distributed throughout Australia. They are often found in areas of long grass, crops, sheds and houses. During favourable conditions their numbers can rapidly increase to plague proportions where they can cause serious damage to crops and houses. Although not declared under Queensland legislation, control of this species is recommended.

Cane Toad (*Rhinella marina*)

Cane toads were introduced into Australia in 1935 and have expanded their territory ever since. They produce highly toxic venom capable of killing most domestic and native animals if ingested. Cane toads eat a wide variety of insects and frogs as well as small reptiles and mammals. This species is not a declared animal under Queensland legislation and there is no legal requirement to control them.



9.4.3.7 Voluntary Offsets for Net Benefit to Koalas

The Offsets for Net Benefit to Koalas and Koala Habitat 2006 (EPA 2006) was developed to provide a framework for the use of environmental offsets towards koala conservation. However, it only applies directly for unavoidable development in high quality koala habitat in south-east Queensland and does not apply to mining projects (under the *Sustainable Planning Act 2009* [SP Act]) and is therefore a voluntary consideration for the Project.

The Project site lies within the Lowest Threat koala management district, (as defined in the Nature Conservation {Koala} Conservation Plan 2006 and Management Program 2006–2016 [EPA, 2006]), and koalas are classified as Least Concern wildlife under the NC Act due to a generally lower perceived threat to their survival. However, evidence exists of a decline in koala numbers within the district (Gordon et al., 2006); therefore, the application of the policy can provide a means of contributing to koala conservation whilst fulfilling any offset requirements (as triggered under other legislation) or voluntary agreements that apply to the Project.

Whilst the development impacts required to be offset under this policy are restricted to habitat loss, the offsetting actions that can be taken to demonstrate net benefit are not. Preference is given to habitat protection and restoration measures, but other actions, such as projects to reduce vehicle mortality on koalas, are able to count towards meeting the required value of the offset package.

9.5 Conclusions

The following conclusions have been developed for this terrestrial ecology assessment of the Project site:

- The EPBC listed Threatened Communities Natural Grasslands of the Central Highlands and the northern Fitzroy Basin is located on site. This Endangered community is represented in RE 11.8.11, and is situated within the proposed transport corridor to the east of MLA 70425.
- One EPBC Act listed species was identified on the Project site, the squatter pigeon (Southern) (*Geophaps scripta scripta*) whilst the little pied bat (*Chalinolobus picatus*) was discovered in areas close enough to include the site within its home range.
- Two areas recognised by DERM as environmentally sensitive areas (ESAs) were identified on the Project site. These include the patch of Brigalow Open Woodland within ERE 10.9.3 to the south west of the site and the Cudmore Resource Reserve in the North West. ESAs surrounding the site include the Cudmore National Park to the west of the site and a nature refuge 27 km to the south.
- The nearest wetlands to the Project site (Coongie Lakes and the Shoalwater and Corio Bays Area) are not anticipated to be impacted by Project activities due to their distance from the site.
- No NC Act protected areas were identified within or adjacent to the site.
- The above findings demonstrate the high environmental values of the site. Given that the Project will impact on some of these values, the following impact mitigation measures will be considered by the Proponent:
 - Utilise qualified environmental staff during vegetation clearance programs to minimise disturbance to rare, threatened or endangered flora and fauna. Permit threatened fauna (i.e. brigalow scaly-foot (*Paradelma orientalis*) and Dunmall's snake (*Furina dunmalli*)) to exit the clearance zone unharmed before clearance activities begin.



- Design, locate and construct infrastructure in such a manner as to minimise Project impacts upon areas of ecological value, e.g. avoid disturbance to EPBC listed species, minimise impacts upon State listed vegetation of concern and EPBC listed Threatened Communities, minimise fragmentation of vegetation remnants and, where possible, use previously disturbed areas for infrastructure development.
- Twenty five distinct vegetation communities were identified on the Project site and 24 of these communities were classed as remnant vegetation as defined by the VM Act. Of the 458 flora species that were identified, none are listed under State or Commonwealth legislation as species of conservation significance. No plants of commercial, horticultural or cultural significance were recorded. However, seven REs with Of Concern DERM Biodiversity Status were identified along with the previously mentioned Endangered RE 10.9.3 and the threatened EPBC listed REs 11.8.11. and 11.3.2
- The following flora values have been identified:
 - Fringing Riparian Woodland – provides a refuge for fauna.
 - Communities with a high floral diversity (e.g. Fringing Riparian Woodland, Silver-leaved Ironbark Woodland, Weeping Bottlebrush Heath and Queensland Yellowjacket Woodland).
 - Floodplains, skeletal hills and tertiary sand plains.
 - Woodlands that are listed as Of Concern or Endangered under DERMs Biodiversity Status (i.e. Brigalow Open Woodland, Poplar Box Open Woodland, Gidgee Open Woodland, Fringing Riparian Woodland, Thozet's Box Open Woodland and the EPBC listed Natural Grasslands of the Central Highlands and northern Fitzroy Basin).
- The following potential Project impacts have been identified for both flora species and the integrity of vegetation communities:
 - Land clearing will reduce the available habitat for certain floral species, in particular those that thrive only in one general soil type (e.g. sandy loam or clay soils).
 - Edge effects created by Project activities may alter microclimatic conditions, thereby reducing plant health and increasing disease susceptibility.
 - High biodiversity vegetation communities may suffer a loss of vegetation integrity and connectivity.
 - Introduction and spread of weed seeds / propagules on footwear, machinery, vehicles and materials during both mine construction and operation phases. Potential weed invasion from earthworks activities in sensitive areas (e.g. watercourses).
 - Increased incidents of fire, due to inappropriate fire regimes or accidental burning.
- Three weed species declared as Class 2 weeds under the LP Act were identified including the Common Pest Pear (*Opuntia stricta*); Velvety Tree Pear (*Opuntia tomentosa*); and Parkinsonia (*Parkinsonia aculeata*).
- A Weed Management Plan is required to address any weed populations that are currently present or may develop on site. Management strategies will include an annual survey of weeds of management concern, implementation of a weed spraying program prior to site development, installation of vehicle wash down facilities, avoid transportation of weed-contaminated soil, and inclusion of weed management awareness in the Site Induction Program.
- Progressive rehabilitation of the Project site will include:



- Planting a range of locally occurring native shrubs, trees and groundcover plants (including existing natural vegetation where possible) that also offer erosion and sediment control;
- Installation of logs, dead trees and stumps on the rehabilitated Project site, thereby providing roosting, feeding and nesting sites for the local fauna;
- Linking of vegetation remnants;
- Focusing on riparian vegetation to protect waterways (including the Sandy and Middle Creek diversions);
- Maintenance of rehabilitation through a rehabilitation monitoring plan;
- Assessment for sustainability; and
- Management of weeds and pest animals through a Pest Management Plan.
- Vegetation offsets for the following EPBC listed community and species are being developed under the EPBC Draft Policy Statement:
 - Threatened Ecological Community: Natural grasslands of the Queensland central highlands and the northern Fitzroy basin (RE 11.8.11);
 - Vulnerable species: Squatter pigeon (*Geophaps scripta scripta*); and
 - Migratory species: cattle egret (*Ardea ibis*) and the rainbow bee-eater (*Merops ornatus*).
- A total of 163 vertebrate fauna species were identified on the Project site during the wet and dry season fauna surveys (including 92 species of birds, 35 mammals (five introduced), 26 reptiles and 10 amphibians (one introduced)). Fauna species recorded that are listed under State and Commonwealth legislation include the squatter pigeon (Southern subspecies) (*Geophaps scripta scripta*) and the little pied bat (*Chalinolobus picatus*). Twenty-four avian species listed as migratory and/or marine under the EPBC Act were observed during the survey periods; however, it is unlikely the Project will have a significant impact on the regional populations of these species.
- The following fauna values have been identified:
 - Open woodlands that provide suitable microhabitats for particular species of skink, lizards and birds.
 - The presence of susceptible small and medium sized native mammals (albeit at a low abundance).
 - A healthy population of woodland birds.
- The following potential Project impacts have been identified for fauna species:
 - Land clearing and mining activities will reduce the available breeding and foraging habitat for native fauna species. For example, localised reduction in roost and nesting sites, microhabitats and potential foraging areas will increase population pressure for resident bats in adjacent areas and may potentially lead to decreased population viability.
 - Vehicle strike and the destruction of tree hollows will also impact on native fauna through an increase in mortality and reduction of suitable habitat.
 - Habitat fragmentation and loss of habitat connectivity due to the construction of roadways and other mine infrastructure (barrier effects). Specific fauna and low mobility species are particularly at risk of these impacts and have the potential to become genetically isolated.
 - Increases in noise, vibration and dust associated with the construction and operational phases of the Project may lead to the displacement of native species from their current home ranges.



- Introduced fauna populations may expand as a result of a decline in local native species populations (e.g. the cane toad, feral pig, European rabbit, house mouse and feral goat).
- Mine-related infrastructure, civil structures and modified topology, may be accessible to fauna and may provide additional water sources.
- The following management strategies are proposed to be employed by the Proponent in order to mitigate Project impacts where required:
 - Minimise environmental impacts at a local scale during the detailed planning and design phases and Project implementation.
 - Minimise vegetation clearance in riparian areas, particularly Well and Sandy Creek, in order to maintain habitat connectivity and provide a movement corridor for small terrestrial fauna species.
 - Ensure fauna spotter / catchers have clearly delineated and identified native vegetation to equipment operators and supervisors prior to removal and permission for clearance has been granted from environmental staff. If fauna is present in these areas, they should be allowed to move on naturally before clearing occurs.
 - Employ appropriate erosion and sediment control systems and procedures to prevent sediment deposition in remaining habitat.
 - Maintain retained areas of existing vegetation to provide a source of seed for mine rehabilitation works, using the most appropriate species for each landscape element of the site. Species chosen for revegetation should be selected from the dominant flora of each community to ensure long-term stability and rehabilitation success.
 - Contour re-created landforms to resemble the original local topography where practical.
 - Allocate a section of the Staff Induction Program to informing staff of the conservation values on the Project site and surrounding areas to increase staff awareness of the species present (including photographs, brief descriptions and management requirements of native species).
- Eight introduced pest fauna species were recorded during the field surveys; five of these species are declared as Class 2 pests under the LP Act. The following pest management actions will be assessed by the Proponent as part of the Feral Pest Control Program:
 - Feral cats (*Felis catus*): controls may include trapping, fencing and possibly poisoning treatments by external contractors, in combination with current land management practices.
 - Feral pigs (*Sus scrofa*): Difficult to control, a combination of physical controls will be employed, including, trapping and/or barrier construction, and possible poisoning treatments by external contractors.
 - European rabbits (*Oryctolagus cuniculus*): rabbits will be controlled via destroying rabbit warrens (via ripping, ploughing, blasting, and fumigating) and possible poisoning treatments by external contractors.
 - Feral goats (*Capra hircus*): mustering, fencing and trapping controls will be used, in conjunction with land management practices.
 - Dingos and wild dogs (*Canis familiaris dingo*): control methods such as trapping, fencing and possible poisoning treatments by external contractors, in combination with current land management practices.