SARAJI EAST MINING LEASE PROJECT

Environmental Impact Statement

Appendix C-1

Terrestrial Ecology Technical Report

BMA

BHP Mitsubishi Alliance

Prepared for
BM Alliance Coal Operations Pty Ltd
ABN: 67096412752

Saraji East Mining Lease Project Baseline Environmental Studies

Terrestrial Ecology Technical Report

16-Aug-2024

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Saraji East Mining Lease Project Baseline Environmental Studies

Terrestrial Ecology Technical Report

Client: BM Alliance Coal Operations Pty Ltd

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Executive Summary

BM Alliance Coal Operations Pty Ltd (BMA) has commissioned AECOM Australia Pty Ltd (AECOM) to undertake ecological assessments to support environmental approvals for the Saraji East Mining Lease Project (the Project).

The Project Site (bounded by Exploration Permit for Coal (EPC) 837, EPC 2103, Mining Lease Application (MLA) 70383, MLA 70459, Mining Lease (ML) 1775, ML 70142 and ML 1782) is located to the north of Dysart in Queensland's Bowen Basin and encompasses approximately 11,427 hectares (ha) of land. The Project Site is located adjacent to the existing Saraji Mine, operated by BMA.

Mining and the infrastructure required to support the Project is not proposed within the full extent of the Project Site; the underground mine layout and surface infrastructure has been optimised to minimise potential impacts within a smaller area of some 3,348 ha within MLA 70383, MLA 70459, ML 70142 and ML 1775. This area is referred to as the Project Footprint.

The baseline environmental studies assess, describe and document the existing environmental values relevant to the Project. The baseline assessment will provide a platform to assess the impact of the Project on the existing environment as part of the Project's Environmental Impact Statement (EIS), including:

- Matters of State Environmental Significance (MSES) under Queensland *Environmental Offset Act 2014* (EO Act)
- Matters of National Environmental Significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Terrestrial flora and fauna studies for this assessment were undertaken by SKM in 2007, 2008, 2010 and 2011, and by AECOM in 2016, 2017 and 2020. The purpose of these studies was to determine terrestrial ecological values present within the Project Site, to enable an impact assessment to be carried out and to propose mitigation strategies. The studies involved a review of existing flora and fauna data and identification of potential conservation significant species and habitat, followed by field surveys. This report combines data from the 2007, 2008, 2010, 2011, 2016, 2017 and 2020 desktop and field investigations.

The ecological values of the Project Site are considered typical for the northern Bowen Basin with large areas of land historically cleared for grazing. Although some large areas of remnant vegetation remain, most have been modified to some extent by historical and current land management practices. The most common modification across the Project Site has been the removal of the shrub and ground layers and replacement with pasture grass species and effects of cattle grazing.

Flora

The literature review identified four threatened ecological communities (TECs) listed under the EPBC Act as potentially present within the Project Site. The presence of two of these communities was confirmed within the Project Site during field surveys: *Natural grasslands of the Queensland Central Highlands* and *the northern Fitzroy Basin* and *Brigalow (Acacia harpophylla dominant and co-dominant)*. The flora survey identified a total of ten Regional Ecosystems (REs), including three listed as endangered, six listed as of concern and one listed as no concern at present as per their Biodiversity Status. The Biodiversity Status is used to determine environmentally sensitive areas (ESAs) through provisions in the *Environmental Protection Act 1994* (EP Act).

Seven flora species of conservation significance were identified as potentially occurring within the Project Site; of these species, field surveys confirmed the presence of one: *Dichanthium setosum* (bluegrass) listed as vulnerable under the EPBC Act. An additional species of conservation significance; *Dichanthium queenslandicum* (King Bluegrass), listed as endangered under the EPBC Act and vulnerable under the Queensland *Nature Conservation Act 1992* (NC Act) was also identified as likely to occur given the habitat available.

Of the 40 exotic species recorded during the vegetation surveys, 11 species were identified as being of management concern. These are listed as a 'Restricted Matter' under the *Biosecurity Act 2014*. Eight of these species are Weeds of National Significance (WoNS).

Within the Project Footprint, field surveys mapped approximately 1,200.22 ha of remnant vegetation communities and the Department of Resources (DoR) mapped approximately 13.74 ha of high value regrowth (HVR). Disturbance of remnant vegetation resulting from construction is 180.38 ha, including surface infrastructure (120.56 ha) and IMG drainage network (59.82 ha). The maximum extent of ponding with potential to impact remnant vegetation is 53.05 ha.

Occurring within the Project Footprint, approximately 210.31 ha of the *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC has potential to be impacted by mining activities and 0.08 ha of *Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC has conservatively been assessed as having potential to be impacted by development of a powerline easement and powerline to the south of the Project Site.

Subsidence may also affect isolated trees where ground movements and surface cracking can affect root zones. While the loss of scattered canopy trees may occur from subsidence relating to surface cracking, these impacts are unlikely to materially impact remnant status or habitat values associated with this native vegetation (including threatened species and ecological communities). Following subsidence, some areas may be subject to temporary ponding; application of remedial drainage works will enable a free-draining final landform to be permanently established in the Post Mining Land Use.

Disturbance to key biodiversity values including TECs, endangered and of concern REs and HVR will be avoided and managed to minimise scale and magnitude of impact and prioritise restoration, particularly associated with riparian corridors. Where significant impacts to remnant vegetation cannot be avoided, offsets are proposed in accordance with the EPBC Act Environmental Offsets Policy 2012 and Queensland Environmental Offsets Framework.

Fauna

The fauna studies identified a total (including exotic fauna) of 188 fauna species occurring within the Project Site. This includes 117 bird, 33 mammal, 14 amphibian and 24 reptile species. Eleven species recognised under the NC Act and/or EPBC Act as conservation significant were identified during ecological surveys. These species and their status under the NC Act and EPBC Act are listed in Table ES-1. An additional four species listed as threatened or migratory under the EPBC Act and or the NC Act were identified as potentially occurring within the Project Site due to the availability of suitable habitat.

Table ES-1 Conservation significant fauna species recorded within the Project Site

Common Name	Scientific Name	EPBC Act[1]	NC Act[2]
Ornamental Snake	*Denisonia maculata*	Vulnerable	Vulnerable
Australian Painted Snipe	*Rostratula australis*	Endangered	Vulnerable
Squatter Pigeon (Southern)	*Geophaps scripta scripta*	Vulnerable	Vulnerable
Greater Glider	*Petauroides volans*	Vulnerable	-
Grey Falcon	*Falco hypoleucos*	-	Vulnerable
Koala	*Phascolarctos cinereus*	Vulnerable	Vulnerable
Short-beaked Echidna	*Tachyglossus aculeatus*	-	Special Least Concern
Caspian Tern	*Hydroprogne caspia*	Migratory	-
Fork-tailed Swift	*Apus pacificus*	Migratory	Special Least Concern
Latham's Snipe	*Gallinago hardwickii*	Migratory	Special Least Concern
White-throated Needletail	*Hirundapus caudacutus*	Migratory	Special Least Concern

[1] Conservation status under the EPBC Act at the time of submission of the Project EPBC Act referral

[2] Conservation status under the NC Act

Generally degraded by land clearing, introduced pasture grasses and grazing, nine broad habitat types were identified: River Red Gum Riparian woodland, *Eucalyptus* and/or *Corymbia* Open Woodland,

Dawson Gum and Brigalow Woodland, Brigalow or Belah Woodland, Oxbow Wetland, Natural Grasslands, Modified Grasslands, Shrubby Brigalow regrowth with Gilgai and Dams.

The Brigalow Belt Bioregion Biodiversity Planning Assessment identifies wildlife corridors within the Project Site. These wildlife corridors are associated with riparian vegetation providing east–west fauna movement opportunities through the landscape and suitable habitat for a range of fauna species including the threatened species Koala (*Phascolarctos cinereus*) and Greater Glider (*Petauroides volans*).

Project impacts on fauna habitat may include habitat loss and fragmentation from direct vegetation clearing. Mitigation measures are proposed to avoid or minimise disturbance from noise, light and general activity, and possible mortality during vegetation clearing or from vehicle strikes. During operation, some habitat modification may also occur due to subsidence effects in areas subject to longwall mining. Most fauna species using the Project Site will generally be resilient to disturbance and do not have highly specialised habitat requirements; these animals will be able to adapt to the potential habitat changes and also utilise adjacent similar habitat.

Mitigation measures are proposed to reduce impacts on species and their habitat, including subsidence management and rehabilitation of riparian corridors to continue to provide opportunities for fauna dispersal. However, the Project is assessed as having potential for a significant impact on habitat for four fauna species, Koala (*Phascolarctos cinereus*), Ornamental Snake (*Denisonia maculata*), Greater Glider (*Petauroides volans*) and Squatter Pigeon (*Geophaps scripta scripta*) due to the loss and degradation of habitat.

Offsets are proposed where significant impacts to threatened fauna are likely in accordance with the EPBC Act Environmental Offsets Policy 2012 and Queensland Environmental Offsets Framework.

Environmentally sensitive areas

The EP Act and the Environmental Protection Regulation 2019 (EP Regulation) categorise ESAs. Category A and B ESAs are protected under Queensland legislation and are easily identified as they are typically based on land tenure; Category B ESAs also include endangered REs (EREs). Category C ESAs are defined in the Code of Environmental Compliance for Exploration and Mineral Development Projects – Version 1.1 (DEHP, 2014).

No Category A or Category C ESAs are present within the Project Site. Category B ESAs occur within the Project Site; three EREs (RE 11.3.1, RE 11.4.8 and RE 11.4.9) are present. Up to 490.64 ha of Category B ESAs occur in the Project Footprint, with direct impacts conservatively estimated at 49.83 ha associated with construction activities and 12.53 ha associated with subsidence-induced ponding. Mitigation measures are proposed to reduce the potential impacts on ESAs.

Offsets

While mitigation and management measures for impacts on terrestrial ecology focus on maximising retention of vegetation across the underground mine footprint, offsets may be required for those areas where vegetation clearing is unavoidable, and in relation to fragmentation due to IMG management infrastructure and potentially from subsidence effects of temporary ponded areas. Significant impacts associated with the construction and operational phases of the Project applies to both MNES and MSES.

The Project will be subject to the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offsets Framework. Potential synergies exist between the EPBC Act Environmental Offsets Policy and offset policies administered by the Queensland Government. The EPBC Act Environmental Offsets Policy and EO Act support the development of complementary offset packages. The overlapping MNES and MSES will be considered when developing offset packages for the Project and offset delivery will preferentially secure offset areas which satisfy both MNES and MSES.

It is expected that the offsets may be staged as set out in the Project Offset Strategy (BMA, 2024c). It is expected that the offsets may be staged as set out in the Project Offset Strategy (BMA, 2024c).

Matters of State Environmental Significance

A review of MSES determined a number of values relating to terrestrial ecology occur within the Project Site and may be significantly impacted by construction and operation of the Project (Table ES-2) after reasonable avoidance and mitigation measures have been undertaken. The Significant Residual Impact Guideline prepared by the Department of the Environment and Heritage Protection (2014) was used to determine the significance of the residual impact as outlined in Table ES-2. Offset proposed for significant impacts to MSES are described in the Project Offset Strategy (BMA, 2024c).

Table ES-2 MSES within the Project Site

MSES Present within the Project Site	Significant Impact Expected
MSES Regulated Vegetation, including:	
• Endangered and/or Of Concern REs	Yes
• Regulated vegetation within the defined distance of a watercourse	Yes
• Regulated vegetation within the defined distance of a wetland area	No
Connectivity areas	Yes
Protected wildlife habitat	Yes
Waterways providing for fish passage	No

Matters of National Environmental Significance

Ecology values recognised as Commonwealth MNES are described in this report; however, the potential for Project impacts to have significant impacts on MNES is subject of a standalone assessment within the EIS (BMA, 2024). Offset proposed for significant impacts to MNES are described in the Project Offset Strategy (BMA, 2024c). Offset proposed for significant impacts to MNES are described in the Project Offset Strategy (BMA, 2024c).

1.0 Introduction

BM Alliance Coal Operations Pty Ltd (BMA) has commissioned AECOM Australia Pty Ltd (AECOM) to undertake ecological assessments to support environmental approvals for the Saraji East Mining Lease Project (the Project).

Located to the north of Dysart in Queensland's Bowen Basin, the Project Site is primarily bounded by Exploration Permit for Coal (EPC) 837, EPC 2103, MLA 70383, MLA 70459, ML 1775, ML 70142 and ML 1782 (except where the southern extent of the powerline connection continues off-tenure, intersecting Lot 10 on CNS83 and Lot 11 on CNS373). The Project Site encompasses 11,427 hectares (ha) of land adjacent to the existing Saraji Mine, operated by BMA. Regional context is presented in Figure 1 and the Project Site is mapped in Figure 2.

Mining and the infrastructure required to support the Project is not proposed within the full extent of the Project Site, with potential construction and operational impacts constrained to a smaller area of some 3,348 ha within MLA 70383, MLA 70459, ML 70142 and ML 1775. This area is referred to as the Project Footprint.

The Project is a greenfield single-seam underground mine development primarily on MLA 70383 commencing from within the existing Saraji Mine (ML 1775). It has been designed to utilise the existing approved Saraji Mine infrastructure, wherever practical. The Project will require upgrades to existing and new mine infrastructure, including proposed rail loading balloon loop, proposed coal handling preparation plant (CHPP), mine infrastructure area (MIA), water storage, product stockpiles and conveyor in the north-west of the Project Site as well as incidental mine gas (IMG) drainage networks (Figure 2).

The Project's Environmental Impact Statement (EIS) assesses the potential environmental impacts associated with the underground layout (optimised) and associated 20-year production schedule. The optimised underground layout was developed based on consideration of a range of factors including resource recovery, coal quality, production rates and site constraints including social and environmental considerations.

The baseline environmental studies describe and document the existing environmental values relevant to the Project Site and Project Footprint. The baseline assessment will also provide a platform to assess the potential construction and operational impacts of the Project on the existing environment and inform management actions associated with the eventual mine closure and decommissioning.

Terrestrial flora and fauna studies for this assessment were undertaken by SKM in 2007, 2008, 2010 and 2011, and by AECOM in 2016, 2017 and 2020. The purpose of these studies was to determine terrestrial ecological values present within the Project Site and inform impact assessment and mitigation strategies. The studies involved a review of existing flora and fauna data, identification of potential conservation significant species and habitat, and field surveys. This report combines data from the 2007, 2008, 2010, 2011, 2016, 2017 and 2020 desktop and field investigations.

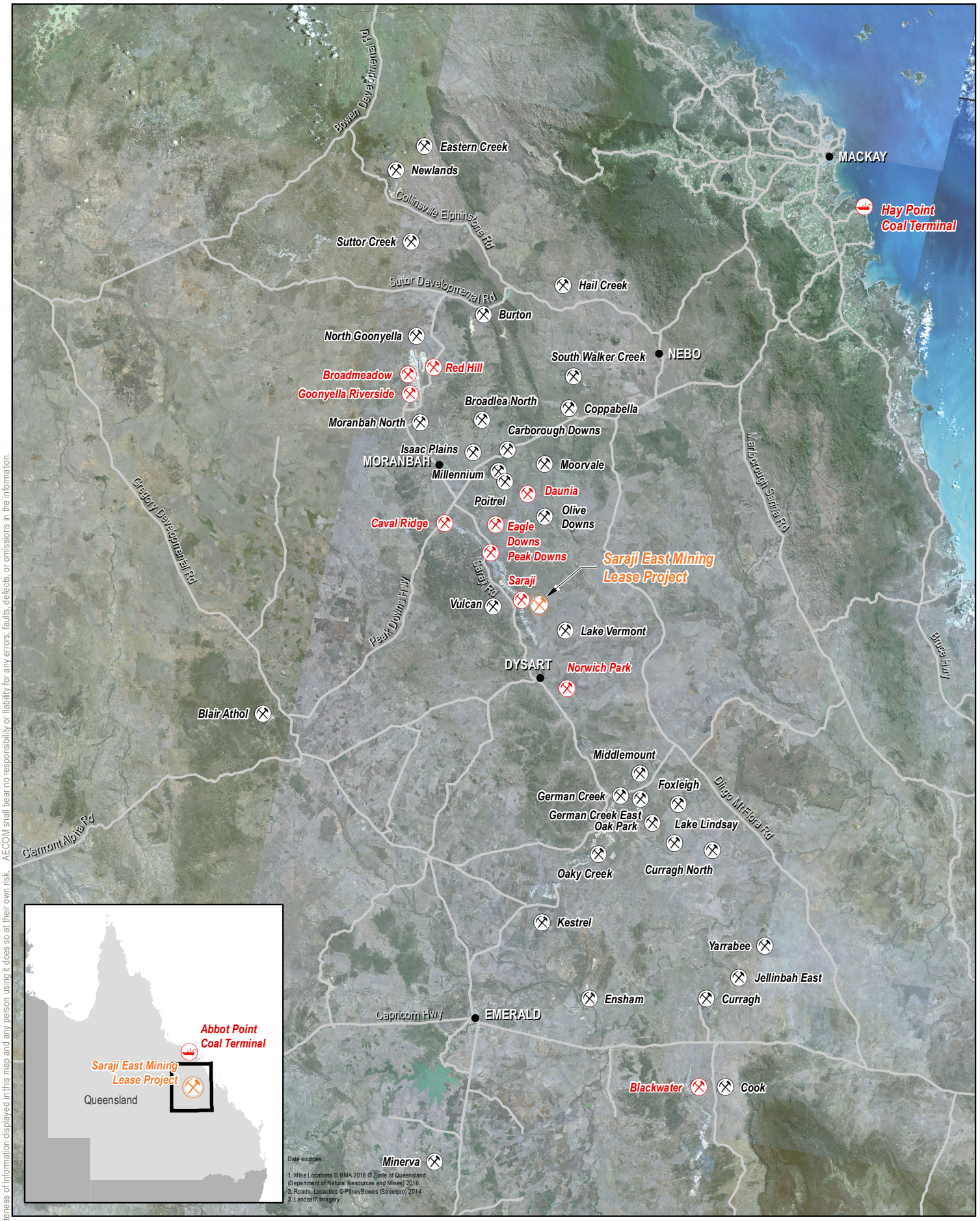
1.1 Study aim and objectives

The aim of the study was to address requirements of Sections 8.1.13 to 8.1.19 of the Terms of Reference (ToR) issued by the Queensland Department of Environment and Heritage Protection (DEHP) (now the Department of Environment and Science (DES)) on 2 June 2017. This includes the requirements to document the floral and faunal assemblages, habitat types and vegetation communities present within the Project Site, with particular focus on the occurrence of conservation significant species and communities. The objectives of the study were to:

- complete flora field surveys to ascertain the distribution, composition, condition and conservation values of regional ecosystems (REs) and threatened ecological communities (TECs) within the Project Site, and confirm the presence of conservation significant flora species
- complete fauna field surveys to census terrestrial fauna assemblages within the Project Site, with an emphasis on targeted searches for threatened species and listed migratory species potentially present

- compile a description of the REs and fauna habitats of the Project Site, including an inventory of flora and fauna species recorded
- confirm the occurrence or potential occurrence of conservation significant species and communities within the Project Site and Environmentally Sensitive Areas (ESAs) (as listed under relevant Commonwealth and State legislation)
- address potential impacts to Matters of State Environmental Significance (MSES)
- identify feral and exotic animals as well as weed species within the Project Site
- assess the potential impacts from the Project on terrestrial flora and fauna values, in particular values of conservation significance
- recommend measures to avoid or mitigate adverse impacts on significant terrestrial flora and fauna at the design, construction, operational, and decommissioning and rehabilitation phases.

This report does not specifically assess potential Project impacts on Commonwealth Matters of National Environmental Significance (MNES), which is addressed in a standalone assessment within the EIS (BMA, 2024).



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LEGEND

- Saraji East Mining Lease Project
- BMA Coal Terminal
- BMA Mine
- Other Mine
- Locality
- Major Road

N

Figure 1
Regional Context

Environmental Impact Statement
Saraji East Mining Lease Project

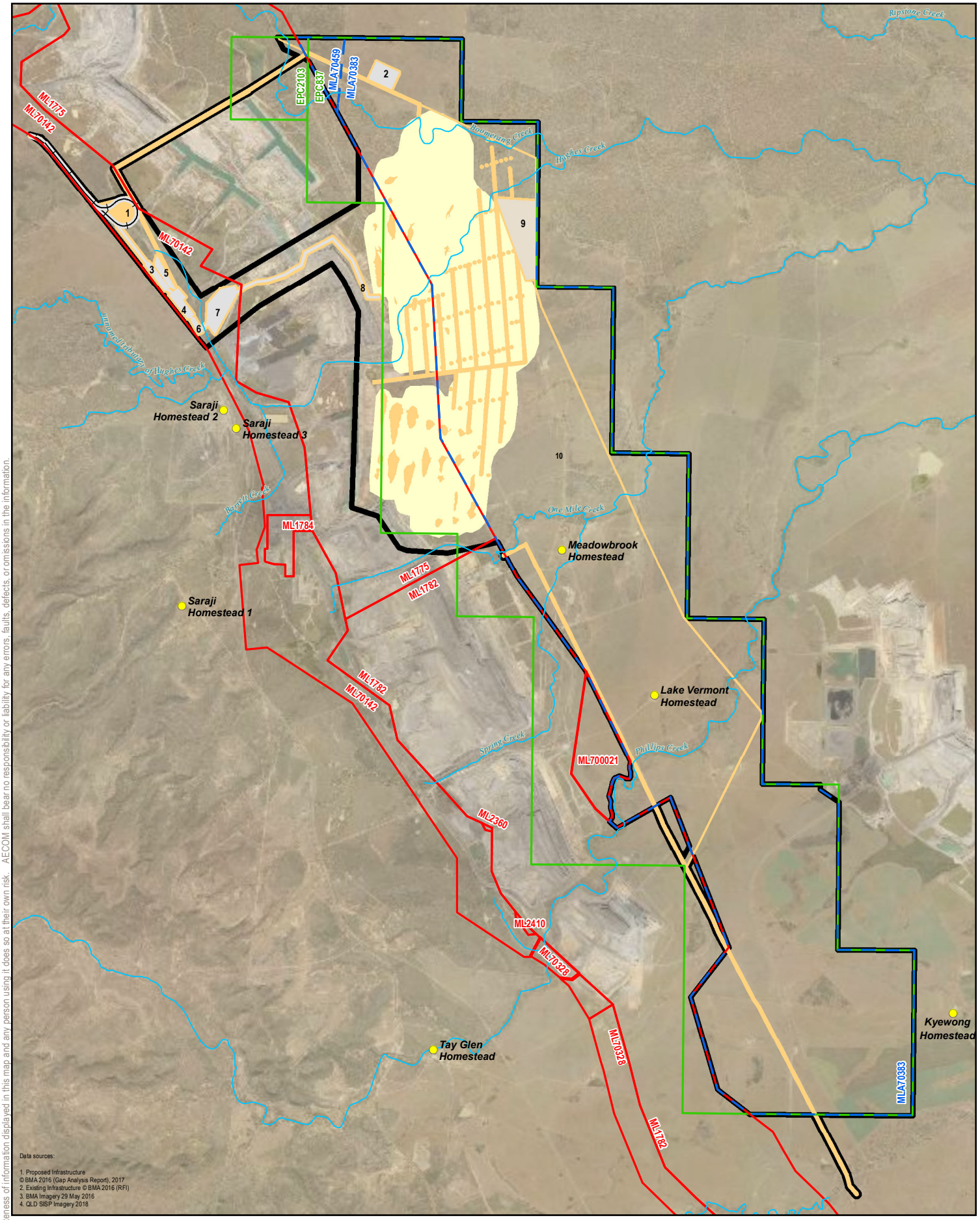
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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Homestead
- Surface infrastructure
- Rail loop
- Watercourse

Surface Infrastructure

1. Rail Loading Balloon Loop
2. Process Water Dam
3. Product Stockpiles
4. CHPP
5. Raw Water Dam
6. ROM Pad
7. Future MIA
8. Conveyor
9. Construction Village
10. Transport and Infrastructure Corridor

N

Figure 2
Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

BMA
BHP Mitsubishi Alliance

DATE: 31/05/2024 VERSION: 6

2.0 Regulatory Framework

2.1 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). Amongst other matters, the EPBC Act provides the legal framework to protect and manage MNES. Nine MNES are currently prescribed and include:

- declared World Heritage properties
- national Heritage places
- declared RAMSAR wetland
- listed threatened species and ecological communities
- listed migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park (GBRMP)
- nuclear actions
- a water resource, in relation to coal seam gas development or large coal mining development.

Under the EPBC Act, a project or activity that may have an impact on an MNES is deemed to be an 'action'. Actions that have or are likely to have a significant impact on an MNES require approval from the Minister for the Environment. Whether or not an action is likely to have a significant impact depends on the sensitivity, value, and quality of the environment that is impacted, and the intensity, duration, magnitude and geographic extent of the impact. If the action consists of a series of activities or a number of related activities, the impacts of each activity must be considered as well as the combined (cumulative) impacts of the series of activities. Consideration is also to be given to all impacts that could reasonably be predicted to follow or be facilitated by the action. Impacts may also be directly or indirectly associated with the action.

On 5 October 2016, BMA referred the Project to the Department of Environment and Energy (DoEE; now DCCEEW) for a decision as to whether the Project constitutes a 'controlled action' under the EPBC Act (Referral No. 2016/7791). On 18 October 2016, the Project was determined to be a controlled action under the EPBC Act due to the potential impacts on MNES.

The relevant controlling provisions under the EPBC Act were determined as being:

- nationally listed threatened species and communities (Section 18 and 18A)
- a water resource, in relation to coal seam gas development and a large coal mining development (Section 24D and 24E).

The Project therefore requires assessment and approval under the EPBC Act. The Minister determined that the assessment be conducted in accordance with the bilateral agreement to which both the Australian and Queensland Governments are signatories which accredits the EIS assessment process under the EP Act. This has been acknowledged within the ToR issued by DES on 2 June 2017.

When deciding whether or not a proposed action is likely to have a significant impact on an MNES, the precautionary principle is required to be applied. A lack of scientific evidence as to whether an impact will occur, or to what extent, cannot be used to support or approve an application under the EPBC Act. In addition, beneficial impacts cannot be considered or used to justify other adverse impacts or an approval under the EPBC Act. Through the *Matters of National Environmental Significance Significant Impact Guidelines,* this principle has been used to determine whether the Project will significantly impact an MNES.

Ecology values recognised as MNES are described in this report; however specific assessment of potential significant impacts on MNES is addressed in a standalone assessment within the EIS (BMA, 2024).

Commonwealth Offsets Policy

In October 2012, the EPBC Act Environmental Offsets Policy 2012 was published (DSEWPC, 2012). The Environmental Offsets Policy will be applicable to the Project. There are five key aims of the policy:

- ensure the efficient, effective, timely, transparent, proportionate, scientifically robust and reasonable use of offsets under the EPBC Act
- provide proponents, the community and other stakeholders with greater certainty and guidance on how offsets are determined and when they may be considered under the EPBC Act
- deliver improved environmental outcomes by consistently applying the policy
- outline the appropriate nature and scale of offsets and how they are determined
- provide guidance on acceptable delivery mechanisms for offsets.

Offsets proposed for significant impacts to MNES are described in the Project Offset Strategy (BMA, 2024c) with final offset requirements subject to the assessment and approval from the DCCEEW. Offsets proposed for significant impacts to MNES are described in the Project Offset Strategy (BMA, 2024c) with final offset requirements subject to the assessment and approval from the DCCEEW.

2.2 Queensland legislation

Planning Act 2016

The *Planning Act 2016* regulates development in Queensland that is made assessable under the Planning Regulation 2017 or the local government planning scheme and is administered by the Department of State Development, Infrastructure, Local Government and Planning. Development within a mining lease (or other resource tenure as stated in the Planning Regulation 2017) is exempt from provisions of the *Planning Act 2016*. If the development is not associated with the mining activity, e.g. off-lease powerline extension, this exemption does not apply.

Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) prohibits the taking or destruction, without authorisation, of protected flora and fauna species in the wild. All native plants and animals in Queensland are protected under Section 71 of the Act. The NC Act also provides for an integrated and comprehensive approach to conserving nature. It provides a legislative basis for research, community education, dedicating, declaring and managing protected areas, and protecting native wildlife and its habitat.

The Nature Conservation (Animals) Regulation 2020 (NC (Animals) Regulation) and the Nature Conservation (Plants) Regulation 2020 (NC (Plants) Regulation) lists the plants and animals considered presumed extinct in the wild, critically endangered, endangered, vulnerable, near threatened, least concern, international and prohibited. The NC (Animals) Regulation and NC (Plants) Regulation discusses their significance and states the declared management intent and the principles to be observed in any taking and use for each group.

Appropriate authorisations or permits under the NC Act are required prior to clearing of listed conservation significant plant species, interfering with an animal breeding place, or removing protected animals unless the activity is exempt. Fauna and flora species identified during field surveys were assessed against threatened species listed in the NC (Animals) Regulation and NC (Plants) Regulation. This ensured any impacts from the construction and operation of the Project could be quantified in relation to significant species requirements.

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) regulates the clearing of native vegetation, including remnant (termed Regional Ecosystems (REs)), high-value regrowth (HVR) (as of May 2018), reef regrowth watercourse vegetation (as of May 2018) and non-remnant on certain tenures, except for where exemptions are applicable under the NC Act, the *Land Act 1994*, and the *Forestry Act 1959*.

Amendments to the VM Act in May 2018 reinstated the regulation of HVR and reef regrowth watercourse vegetation. HVR areas are those which have not been cleared for over 15 years if the area is an endangered, of concern or least concern regional ecosystem. Reef regrowth watercourse vegetation is native regrowth vegetation on watercourse areas within the Great Barrier Reef Catchments. The clearing of this vegetation has been regulated to increase wetland and watercourse bank stability, and maintain water quality, habitat and landscape stability.

In Queensland, the VM Act does not apply to mining leases; although mining is exempt development, the VM Act provides useful guidelines on management including mapping of vegetation communities and biodiversity status. Conservation status of REs and HVRs is based on their pre-clearing and remnant extent, as gazetted under the VM Act and listed in the Regional Ecosystem Description Database (REDD) maintained by the Queensland Department of Resources (DoR). An RE considered to have "Vegetation Management Status" is described as an:

- **Endangered** regional ecosystem:
  - less than 10 per cent of its pre-clearing extent remaining, or
  - 10 per cent to 30 per cent of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 ha.
- **Of Concern** regional ecosystem:
  - 10 per cent to 30 per cent of its pre-clearing extent remaining, or
  - more than 30 per cent of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 ha.
- **Least Concern** regional ecosystem:
  - more than 30 per cent of its pre-clearing extent remaining and the remnant vegetation remaining is more than 10,000 ha.

Environmental Protection Act 1994

All mining and exploration activities in Queensland are conducted under an Environmental Authority (EA) as set out under Section 183 of the *Environmental Protection Act 1994* (EP Act). The EA lists conditions with which the activity must comply in order to mitigate impacts to the environment, including clearing limits.

Under the EP Act and EP Regulation certain environmental features are protected within mining lease areas. These are termed 'environmentally sensitive areas' and include such features as national parks, conservation reserves, wetlands of international importance, heritage places and endangered regional ecosystems (ERE). Category A ESAs appear in Queensland legislation and are typically based on land tenure; Category B ESAs are conservation significant under Queensland legislation or ERE; Category C ESAs are defined in DEHP's (2014) Code of Environmental Compliance for Exploration and Mineral Development Projects – Version 1.1[1].

Biosecurity Act 2014

The *Biosecurity Act 2014*, which commenced on 1 July 2016, ensures a consistent, risk-based approach to biosecurity in Queensland. The Act provides biosecurity measures to safeguard Queensland's economy, agricultural and tourism industries and environment from:

- pests (e.g. wild dogs and weeds)
- diseases (e.g. foot-and-mouth disease)
- contaminants (e.g. lead on grazing land).

[1] Category C ESAs have been defined in the Code of Environmental Compliance for Exploration and Mineral Development Projects – Version 1.1 (DEHP). This document has been superseded however Category C ESAs are still relevant as confirmed by DES on 5 March 2018

The Act replaced the many separate pieces of legislation that were previously used to manage biosecurity. Decisions made under the Act will depend on the likelihood and consequences of the risk. The Biosecurity Regulation 2016 sets out how the Act is implemented and applied.

Under the Act, all persons have a general biosecurity obligation to take all reasonable and practical measures to prevent or minimise the biosecurity risk. This includes:

- preventing or minimising adverse effects of a biosecurity risk
- minimising the likelihood of causing a biosecurity event and deal with a biosecurity matter by limiting the consequences of a biosecurity event should one arise
- not exacerbating the effects of a biosecurity matter.

Nature Conservation (Koala) Conservation Plan 2017

The Nature Conservation (Koala) Conservation Plan 2017 provides for the conservation of the Koala (*Phascolarctos cinereus*) in Queensland and includes provisions for the assessment and management of Koalas (*Phascolarctos cinereus*) during the development approval processes and implementation of projects. Different levels of provisions apply to the three Koala districts that have been mapped across Queensland. The Project is located with Koala District C. This district includes areas where Koalas (*Phascolarctos cinereus*) are found; however, provisions for clearing in Koala District C are less stringent than those in Koala Districts A and B (for example, Districts A and B are subject to sequential clearing conditions).

Environmental Offsets Act 2014 and Environmental Offsets Regulation 2014

The *Environmental Offsets Act 2014* (EO Act) coordinates the delivery of environmental offsets across jurisdictions and provides a single point-of-truth for offsets in Queensland. The Environmental Offsets Regulation 2014 (EO Reg) provides details of the prescribed activities regulated under existing legislation and prescribed environmental matters to which the EO Act applies. These matters are:

- Matters of National Environmental Significance (MNES)
- Matters of State Environmental Significance (MSES)
- Matters of Local Environmental Significance (MLES).

Environmental Offsets Policy 2022

The Environmental Offsets Policy 2022 Version 1.12 (EO Policy) provides a single, consistent, whole-of-government policy for the assessment of offset proposals to satisfy offset conditions.

The EO Policy outlines seven principles that environmental offsets must meet:

- offsets will not replace or undermine existing environmental standards or regulatory requirements, or be used to allow development in areas otherwise prohibited through legislation or policy
- environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact
- offsets must achieve a conservation outcome that achieves an equivalent environmental outcome
- offsets must provide environmental values as similar as possible to those being lost
- offset provision must minimise the time-lag between the impact and delivery of the offset
- offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values
- where legal security is required, offsets must be legally secured for the duration of the impact on the prescribed environmental matter.

For land-based offsets, the suitability of the offset site relative to the impact site and the prescribed environmental matters is measured through undertaking a habitat quality analysis. The Guide to Determining Terrestrial Habitat Quality (Department of Environment and Science, 2020c) must be used for REs and species offsets (including advanced offsets) to undertake this analysis, unless an alternative approach is approved by DES as being able to measure a conservation outcome.

Offsets proposed for significant impacts to MSES are described in the Project Offset Strategy (BMA, 2024c) and is also discussed in Section 11.3 with final offset requirements subject to the assessment and approval from the DES.

2.3 Isaac Regional Council Biosecurity Plan 2020-2023

The Isaac Regional Council Biosecurity Plan 2020-2023 aims to minimise biosecurity risk within the local government area by providing a framework to mitigate the impacts of pest animal and weeds on local biosecurity considerations. The Biosecurity Plan identifies five desired outcomes including:

1. strategic Planning and Management – Pest management planning is collaborative, co-ordinated, and risk-based
2. stakeholder Awareness and Commitment – All stakeholders have an improved working knowledge of regional pest species, understand their biosecurity responsibilities, and hold agency in management goals
3. effective and Integrated Management Systems – Pest management is based on best practice information and is integrated
4. proactivity for Prevention and Early Intervention – Timely and collaborative responses diminish pest spread and promotes cost-effective, long-term asset protection
5. monitoring and Assessment **–** Review processes strive to better understand and improve biosecurity management.

The Operational Guide within the Isaac Regional Council Biosecurity Plan 2020-2023 determines management goals for priority pest animal and weed species within the local government area. Controls will be established in line with the Biosecurity Plan.

3.0 Assessment Methodology

3.1 Desktop assessment

A desktop review of ecological data and literature was undertaken to characterise ecological values and identify the potential presence of conservation significant species, habitats and vegetation communities within the Project Site. This included a thorough review of the following key references:

- EPBC Act Protected Matters Search Tool (PMST) (Department of Agriculture Water and the Environment, 2020a)
- Queensland Wildlife Online search results for flora and fauna species records (DES, 2020b)
- DoR Vegetation Management Regional Ecosystem (RE) Map, including Essential Habitat (DoR, 2022a)
- DoR Regulated Vegetation Management Map to determine the extent of Category A, Category B, Category C and Category R vegetation (DoR, 2022b)
- DoR Vegetation management watercourse and drainage feature map (DoR, 2022c)
- Brigalow Belt Bioregion Biodiversity Planning Assessment (BPA) Version 1.3 (DES, 2020a)
- Environmentally Sensitive Areas Mapping (DEHP, 2017)
- Atlas of Living Australia (ALA) (Australian Government, 2020)
- aerial photography
- current distribution texts for vascular flora and fauna taxa
- relevant publications, including scientific papers and literature
- Ecological studies undertaken within the adjacent Saraji Mine including:
    - Ecoserve (2005). A review of Habitat Values for Biodiversity and Species of Conservation Significance. Final Report Submission for BMA Saraji Mine
    - EcoServe (2007). Biodiversity and Threatened Species Action Plan for Saraji Mine. Final Report Submission 27th June 2007. An unpublished report prepared for BMA Saraji Mine
    - EcoServe (2006). 2006 Winter Vertebrate Fauna Surveys of Remnant Habitats on Saraji Mine. Draft Submission. An unpublished report prepared for BMA Saraji Mine
    - EcoServe (2008). Baseline Fauna Surveys of Rehabilitated Lands on Saraji Coal Mine. An unpublished report prepared for BMA Saraji Mine
    - EcoServe (2009). Baseline Fauna Surveys of Rehabilitated Lands on Saraji Coal Mine. An unpublished report prepared for BMA Saraji Mine
    - SKM (2007 and 2010). Results from Comprehensive Fauna and Flora Surveys of MLA 70383 for BMA
    - SKM (2008). Results from Brigalow Mapping within MLA 70383 for BMA
    - SKM (2009). Results from Targeted Survey for Ornamental Snake on MLA 70383 for BMA
    - SKM (2010). Results from Flora Survey for RE Mapping on MLA 70383 for BMA
    - SKM (2011). Results from Winter Fauna Surveys conducted on MLA 70383 for BMA.

In order to identify the range of flora and fauna species potentially present within the Project Site and the broader region, reviews of the above data sources were conducted for the area bound by the coordinates presented below in Table 3. Prior to each survey period, new database searches were conducted. The search areas used for each data source do not necessarily correlate to the Project Site boundary due to the inherent search parameters for each database.

Table 3 Data source search parameters

Data Source	Search Area	Search Buffer
EPBC Act PMST	Bounded by: -22.2247, 148.17096 -22.2247, 148.518 -22.6227, 148.518 -22.6227, 148.17096 -22.2247, 148.17096	10 km (built into these search coordinates)
Wildlife Online	Latitude: -22.6227 to -22.2247 Longitude: 148.1710 to 148.5180	10 km (built into these search coordinates)
Environmentally Sensitive Areas	Latitude: -22.6227 to -22.2247 Longitude: 148.1710 to 148.5180	100 km
Biodiversity Planning Assessment	Latitude: -22.6227 to -22.2247 Longitude: 148.1710 to 148.5180	100 km
• REs • Essential Habitat	Restricted to bounds of the Project Site (see Figure 2).	0.0 km

3.1.1 Databases

Biodiversity values

Biodiversity significance within the survey area was identified from the BPA for the Brigalow Belt (DES, 20020a). The BPA implements the use of Biodiversity Assessment and Mapping Methodology (DEHP, 2014) to consistently determine the biodiversity significance of habitats and communities. The information produced is largely based upon remnant vegetation mapping generated by the Queensland Herbarium (RE mapping) and identifies three levels of biodiversity significance: State, regional and local. Other factors that contribute to significance ranking include diversity, fragmentation, habitat condition, resilience, threats and ecosystem processes.

EPBC Act MNES

The PMST generates a list of protected matters (as per the EPBC Act) that may occur in or near the search area. The database incorporates information from a range of sources including government, research and community organisations.

The MNES database has inherent limitations based on the accuracy of geographic data for some matters. In particular, confirmation of the presence of threatened or migratory species at a given site is not possible from the database, as data presented are for potential occurrences of species within a general area, rather than for known occurrences at a specific site.

The relative reliability of this database must be kept in mind as species highlighted by this search do not necessarily correlate to an actual observation. Species are highlighted by the database if their known distribution overlaps with the search area by one degree of latitude or longitude (approximately 100 km). This indication of potential presence does not take into account whether suitable vegetation, geology, soil, climate or habitat types are present to support the occurrence of a significant species or community.

Regional ecosystem mapping

REs are used to describe the relationships between vegetation communities and the environment at the bioregional scale. REs are mostly derived from linking vegetation mapping units recognised at a scale of 1:100,000 to land zones that represent major environmental variables, in particular geology, rainfall and landform.

The Queensland Herbarium has developed a program for mapping remnant REs across Queensland; however, it should be noted that there are inaccuracies inherent in RE mapping at a scale of 1:100,000. As a result these maps provide an indication of what is potentially present and cannot be relied upon as an inherently correct source of vegetation mapping. On-site ground-truthing is required to confirm the presence of RE types and extents, verify floristics and structure and confirm conservation status.

Under the VM Act, REs (and HVR) are assigned a conservation status (referred to as a vegetation management status (VM status)) based on an assessment of the pre-clearing and remnant extent of a RE. A second VM Act status rating (biodiversity status) is defined by DES and is based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a RE.

Vegetation is mapped as remnant by DES where the dominant canopy has greater than 70 per cent of the height and greater than 50 per cent of the cover relative to the undisturbed height and cover of that stratum (Accad *et al.,* 2017). The vegetation community must also be dominated by species characteristic of the REs undisturbed canopy.

Wildlife online

DES's Wildlife Online database contains recorded wildlife sightings and listings of plants, fungi, protists, mammals, birds, reptiles, amphibians, freshwater fish, marine cartilaginous fish and butterflies in Queensland. The database is based on collated species lists and wildlife records acquired by DES through a range of sources including specimen collections, research and monitoring programs, and community wildlife recording programs.

Atlas of Living Australia

The Atlas of Living Australia (ALA) is a national biodiversity database which contains spatial data for fauna and flora occurrence records, expert modelled distribution maps of potential species' ranges, photographs, maps, sound recordings and literature. This database is funded by the Australian Government, through the National Collaborative Research Infrastructure Strategy (NCRIS).

Essential habitat mapping

Essential Habitat mapping (under the VM Act) is provided by DoR and is currently maintained in the Essential Habitat database. Essential Habitat is compiled from a combination of species habitat models and buffered species records.

Essential Habitat for threatened species is defined as an extent of vegetation depicted on RE mapping:

- that has at least three Essential Habitat factors for the species, that are stated as mandatory for the protected wildlife in the Essential Habitat database, or
- in which the threatened species, at any stage of its life cycle, has been located.

Environmentally sensitive areas

ESAs include (but are not limited to) national parks, State forests, world heritage areas, Ramsar wetlands, and nationally important wetlands. ESA maps are generated from the DES 'maps of environmentally sensitive areas' webpage.

3.1.2 Aerial photograph analysis and survey site location

Survey sites for the field assessment were chosen from analysis of aerial photography and stratification based on RE mapping to enable the field survey to target a representative range of vegetation within the Project Site.

3.2 Field assessment

Several field surveys have been conducted on, or in the vicinity of, the Project Site over the past 15 years. EcoServe studies between 2005 and 2009 and SKM studies for MLA 70383 between 2007 and 2011 provide background information on the flora and fauna present in the locality of the Project Site and results of those surveys have been incorporated into literature review analysis.

To supplement previous field surveys, four additional biodiversity surveys have been conducted across the Project Site by AECOM between 2016 and 2020 including:

- winter season survey between 27 and 29 August 2016
- spring season survey between 6 and 10 October 2016
- summer season survey between 30 January and 3 February 2017

- autumn season survey between 23 and 20 March 2020.

Field assessments, including those conducted previously by SKM have involved flora and fauna surveys, which are described below.

3.2.1 Flora survey

Flora surveys assessed floral taxa and vegetation communities in keeping with the methodology employed by the Queensland Herbarium for the survey of REs and vegetation communities (Neldner, 2012). Flora surveys involved a botanical assessment at representative sites within each remnant, non-remnant and regrowth vegetation community as identified from desktop searches outlined in Section 3.1.1. The surveys employed standard methods including secondary survey sites, tertiary survey sites, quaternary survey sites and random meander search areas. RE classification (Sattler, P., & William, R., 1999) was determined based on estimated structural and floristic analysis and in accordance with the REDD (Queensland Herbarium, 2016).

Secondary survey sites followed the Queensland Herbarium standards as identified in Neldner *et al.* (2005) using formalised secondary-level sampling procedures. Data recorded included location, environmental and overall structural information as well as a comprehensive list of woody species and percentage cover. Tertiary transects recorded descriptive site information such as location, aspect, slope, soil type, landform, disturbance, fire history and general notes on ecological integrity. Quaternary-level sites were utilised to verify vegetation units and confirm dominant characteristic species. Structural analysis included recording the height class and life form of the dominant species within the mid and canopy strata as per Neldner et al. (2005). A number of vehicle traverses of the survey area were included during the survey periods to identify changes in landform and identify vegetation community boundaries.

To assess threats, evidence of previous disturbance, fire history, incidence of exotic species and general notes on soil type and ecological integrity were compiled for each quaternary survey site. Several time encoded digital photographs were taken at each plot as a reference.

Following the assessment at the tertiary and quaternary sites, a further area of approximately one hectare surrounding each plot was also searched for 20 minutes utilising meander searches (Cropper, 1993). Where a vegetation community presented potential critical habitat for listed flora species, the search area was broadened to capture flora species from an extended search area. Searches for *Dichanthium setosum* (Bluegrass), *Dichanthium queenslandicum* (King Bluegrass) and *Aristida annua* were also undertaken during the targeted surveys of natural grasslands in suitable habitat for these species.

The combined flora survey effort undertaken since 2007 comprises a total of 185 sites, including 14 secondary, 41 tertiary transects and 130 quaternary sites as shown in Figure 3 and outlined in Table 4. To consider the accumulated effort and suitability of technique used, a summary of each flora survey undertaken across the Project Site is provided below.

Table 4 Summary of flora survey methods and effort across survey period

Assessment methodology	SKM (2007 – 2010)	AECOM (2016 – 2017)	AECOM 2020 (20 to 23 March)	Total
Secondary Sites	14	-	-	**14**
Tertiary Sites	-	29	12	**41**
Quaternary Sites	50	33	47	**130**
TOTAL	64	62	59	**185**

2007 Flora survey (SKM)

A flora survey of MLA 70383 was completed by SKM between 17 and 21 November 2007. The survey method followed Queensland Herbarium standards as identified in Neldner *et al.* (2012) using a combination of secondary and quaternary level sampling, as well as informal site observations. The flora survey involved the following:

- Mapping the extent of TECs across the mining lease, including the *Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC and the *Brigalow (dominant and co-dominant*) TEC.
- Targeted survey for the vulnerable *Dichanthium queenslandicum* (King Bluegrass) (protected under the NC Act and EPBC Act).
- Field checking of RE mapping of the mining lease (Version 5.0, 2003).
- Compilation of a flora inventory for the mining lease, based on secondary and quaternary level sampling.

2008 Brigalow vegetation survey (SKM)

In November 2008, SKM surveyed the extent of remnant brigalow vegetation communities across MLA 70383. All patches of Brigalow within MLA 70383 were ground-truthed, and the boundaries mapped.

2010 Flora survey (SKM)

The 2010 flora survey was conducted by SKM between 7 April 2010 and 11 April 2010. This survey focused on collation of secondary-level vegetation data for each vegetation type in the Project Site. Fourteen sites were surveyed that represent all REs mapped across the Project Site (Figure 3).

The field survey methodology followed the Queensland Herbarium standards as identified in Neldner *et al.* (2012) using formalised secondary-level sampling procedures, as well as informal site observations. Proformas were used for the collection of field data. Data included location, environmental and overall structural information as well as a comprehensive list of woody species and percentage cover.

REs were classified according to the bioregion, land zone and vegetation type, in accordance with the system of Neldner *et al.* (2012) for remnant and non-remnant vegetation.

Opportunistic traverses of natural grasslands across the Project Site were also completed to search for conservation significant grassland species. An inventory of flora species was recorded from the vegetation survey plots and informal site observations across the Project Site.

2016 and 2017 Regional ecosystem survey (AECOM)

Flora surveys were conducted by AECOM between 27 August 2016 and 29 August, 2016, 6 October 2016 and 10 October 2016, and 30 January 2017 and 3 February 2017. The combined survey effort was focused on ground-truthing REs within the Project Site. A total of 62 sites were surveyed including 29 tertiary transects and 33 quaternary sites (Figure 3).

Tertiary transects were 10 by 50 metres (m) (a total area of 500 square metres (m^2)) as per the Queensland Herbarium methodology (Neldner *et al.* 2012). Structural analysis included recording the height class and distribution of the dominant species within each strata present. The Foliage Projection Cover (FPC) of each strata was calculated along each transect, where foliage projection intersected a 50 m centre tape. FPC of the ground layer was determined using visual estimation of cover within five, 1 m^2 subplots spaced at 12.5 m intervals along each transect.

Quaternary-level sites were utilised to verify vegetation units and confirm dominant characteristic species (Figure 3). Structural analysis included recording the height class and life form of the dominant species within the mid and canopy strata as per Neldner *et al.* (2012). RE classification (Sattler and Williams, 1999) was determined based on estimated structural and floristic analysis.

Following the assessment at the tertiary and quaternary sites, an area of approximately one ha surrounding each plot was searched for 20 minutes utilising the random meander technique (Cropper, 1993). Care was taken to avoid sampling in different vegetation types to those of the plots. Meander searches were employed to:

- identify additional less abundant species not recorded within survey plots
- identify any potential significant threatened or species not identified within the survey plot
- confirm the representativeness of plot locations
- confirm boundaries and ecotone areas between vegetation communities.

2020 Flora surveys (AECOM)

During the 2020 field survey, 19 *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC assessments were completed (Figure 3). *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC assessments were undertaken to identify vegetation communities meeting the key diagnostic and condition threshold criteria as described in the Commonwealth Approved Conservation Advice (Threatened Species Scientific Committee, 2013). The assessment consisted of collecting the following data at various sites within Brigalow vegetation:

- Dominance or co-dominance of *Acacia harpophylla* (*Brigalow*)
- Age of community – at least 15 years since last comprehensively cleared
- Exotic perennial cover – less than 50 per cent total vegetation cover of the patch
- Patch size – greater than 0.5 ha.

An additional 12 tertiary sites and 47 quaternary sites were also undertaken to confirm previous vegetation mapping (Figure 3).

Specimen identification

Where plant species could not be identified in the field, fruiting and/or flowering specimens were taken to assist with identification. For those species not field identified during the surveys, samples were pressed and dried, and positive identifications of plant specimens were subsequently made under laboratory conditions or submitted to the Queensland Herbarium for identification. A sample of conservation significant species recorded was also submitted to the Herbarium for confirmation by SKM.

3.2.2 Nomenclature

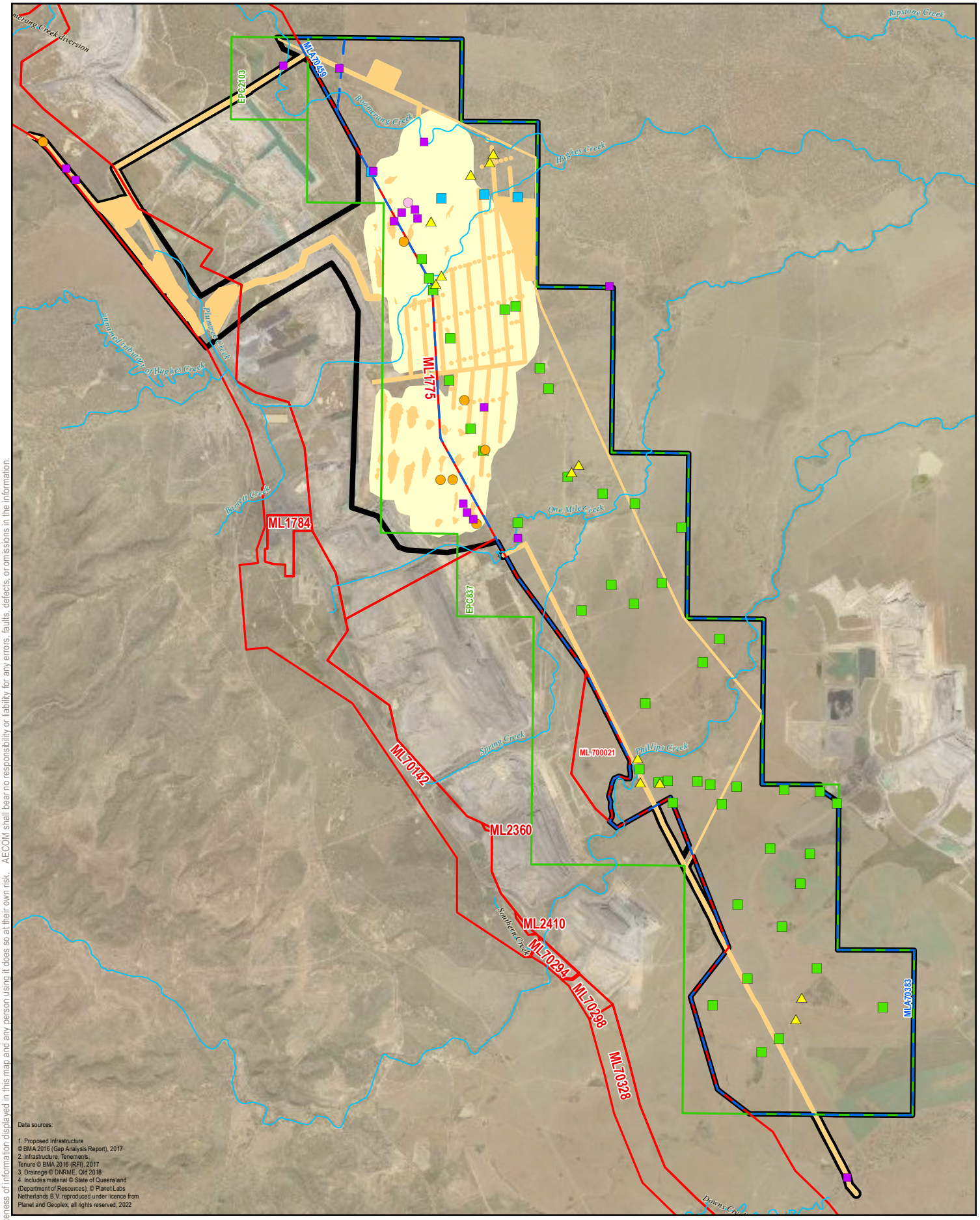
Taxonomic nomenclature used for the description of floral species is according to Bostock and Holland (2017). Exotic flora species are signified in text by an asterisk (*). Field references used for the identification and description of floral species include Anderson (2016); Booker and Kleinig (2006); Lester (2008); and Moore (2005).

3.2.3 Field data verification process

The EIS presents both State mapping of Regional Ecosystems (RE) and ground-truthed vegetation mapping based on findings of multiple field surveys conducted for the Project area by suitably qualified ecologists since 2010. Ground-truthed field data is appropriate to describe existing biological diversity and condition, including listed flora and fauna species and vegetation communities, and inform assessment of likely impacts on biodiversity and integrity of ecological processes, connectivity of habitats and ecosystems, including matters of national and state environmental significance. Site level data from various sources referenced in the EIS is available as spatial datasets, supported by site data sheets and photographs.

RE (Table 8) and HVR (Table 9) are characterised according to mapping produced by DoR. This data is used to inform the assessment of significant impacts to regulated vegetation as MSES with potential offset liability. As part of detailed design investigations, BMA may progress ratification of ground-truthed data by the Queensland Herbarium. Queensland Herbarium ratification for field mapping of regional ecosystems is not required by the Project Terms of Reference or typical given the concept stage of Project design. An application for a property map of assessable vegetation (PMAV) can follow detailed design for certification to confirm assessment and management requirements, including offset liability, before construction impacts.

Before construction impacts, BMA will provide site-level data as evidence to support ratification of ground-truthed vegetation mapping where required to be used as a basis for significant impact assessment and offset.



Data sources:

1. Proposed Infrastructure
© BMA 2016 (Gap Analysis Report), 2017
2. Infrastructure, Tenements,
Tenure © BMA 2016 (RPI), 2017
3. Drainage © DNRME, Qld 2018
4. Includes material © State of Queensland
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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Flora survey sites

- Quaternary RE assessment (AECOM 2020)
- Tertiary RE assessment (AECOM 2020)
- Tertiary RE assessment (AECOM 2017)
- Quaternary RE assessment (AECOM 2017)
- Secondary RE assessment (SKM)
- Quaternary RE assessment (SKM)

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Figure 3
Flora survey sites

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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3.2.4 Fauna survey

The sampling of vertebrate fauna species including threatened species was undertaken using standard methodologies for the systematic survey of terrestrial fauna in eastern Australia (Eyre *et al.*, 2018) and relevant EIS, Commonwealth and species-specific survey guidelines including:

- EIS information guideline: Flora and fauna (Department of Environment and Heritage Protection, 2019)
- Survey guidelines for Australia's threatened reptiles (Department of Sustainability, Environment, Water, 2011)
- Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010b)
- Survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population and Communities, 2011)
- Survey guidelines for Australia's threatened bats (Department of the Environment Water Heritage and the Arts, 2010a)
- Draft referral guidelines for the nationally listed Brigalow Belt reptiles (Department of Sustainability Environment Water Population and Communities, 2011)
- Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre *et al.*, 2018)
- Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (Department of the Environment and Energy, 2017e)
- species-specific survey guidelines, such as the survey guidelines for the Koala (*Phascolarctos cinereus*) (Department of the Environment, 2014), Painted Honeyeater (*Grantiella picta*) (Rowland, 2012b), Ghost Bat (*Macroderma gigas*) (Hourigan, 2011), and Yakka Skink (*Egernia rugosa*) (Ferguson & Mathieson, 2014).

During each survey period a range of methods were employed including live capture and release trapping, bird census, herpetofauna searches, spotlighting searches, active searches, call playback, microchiropteran bat call detection (Anabat) and habitat assessments. These fauna survey methods and associated survey period are described in Table 5.

Table 5 Description of fauna survey techniques and associated survey period

Survey Technique	Description or methodology and effort	Survey period
Elliot trapping	Large and small Elliott traps were used to capture ground-dwelling mammals. At four sites, twenty small traps were placed in a single transect line at intervals of approximately 5-10 m. Two large traps were placed along the transect line, at the first and tenth trap. At an additional three sites, twenty small traps were placed in a single transect line at intervals of approximately 5–10 m, with no large traps. Traps were left open for four consecutive nights and checked early each morning within two hours of sunrise. Traps were baited with a mixture of rolled oats, peanut butter, honey and vanilla essence.	November 2007 April 2010
Cage trapping	Cage traps were used to target arboreal and terrestrial mammals. At the four Elliot trap sites where large traps were also used, a single cage trap was placed at the beginning of the Elliot transect line. Traps were left open for four consecutive nights and checked early each morning within two hours of sunrise. Traps were baited with fruit scraps.	November 2007 April 2010

Survey Technique	Description or methodology and effort	Survey period
Harp trapping	Due to the difficulties associated with identifying fast flying, small microbats, the use of harp traps is recommended. Trapping was conducted within the vicinity of potential roosts and forest flyways, rocky outcrops, scarps and riparian zones. Traps were checked periodically throughout the night and were packed down after midnight, to reduce stress on heavily pregnant females and to allow lactating females to return to their young. Trapped microbats were identified to species level in the field. Appropriate measurements were recorded (such as forearm length, weight, outer canine width (OCW)), where necessary for determination to species level.	November 2007 April 2010
Pitfall traps / funnel traps	Pitfall traps and funnel traps were installed to capture reptiles, amphibians and small mammals. At six of the Elliot trap-sites, a single pitfall line was installed comprising five pitfalls linked by a drift fence. Six funnel traps were installed along each drift fence. Pitfalls and funnel traps were left open for four consecutive nights and were checked each morning and afternoon.	November 2007 April 2010
Bird surveys	Bird surveys were conducted during and after morning trap clearing at all trap sites with additional observations made at an additional five sites. These surveys included observations of birds and identification of bird calls.	November 2007 April 2010 July 2011 August 2016 October 2016 January 2017 March 2020
Spotlighting searches	Roaming/meandering nocturnal searches in suitable habitat using headtorches and hand-held spotlights. Spotlighting from the passenger window of a slow-moving vehicle was also undertaken along farm tracks, targeting larger ground and arboreal mammals and nocturnal birds.	November 2007 April 2010 August 2016 October 2016 January 2017 March 2020
Anabat	Unattended bat recorders (Anabat Swift and Songmeter SM2) were placed in the vicinity of foraging sites such as vegetation corridors, flyways, over watercourses and adjacent to artificial waterbodies (dams) in representative potential, likely and known habitat. Data recorded on the bat recorders were analysed by a qualified specialist, Greg Ford of Balance! Environmental. The format and content of the analysis summary reports comply with nationally accepted standards for the interpretation and reporting of Anabat data (Reardon, 2003).	November 2007 April 2010 July 2011 August 2016 October 2016
Call Playback	Playback sessions targeting nocturnal mammals, birds and owls were conducted at selected sites. The activity involved broadcasting pre-recorded calls, and then listening and spotlighting the area immediately afterwards.	November 2007 April 2010
Active fauna searches	Active diurnal and nocturnal searches were undertaken for reptiles, amphibians and small mammals included scanning of trees and ground, searching beneath microhabitat such as rocks, fallen timber and peeling bark, and digging	November 2007 April 2010 July 2011

Survey Technique	Description or methodology and effort	Survey period
	through leaf litter and soil at tree bases. Searches also focussed on locating and identifying tracks and traces such as nests, scats, diggings and tree scratchings. In suitable habitat, searches for signs of activity specific to threatened fauna were also conducted (i.e. searches for communal latrine sites for Yakka Skink (*Egernia rugosa*) and searches for Koala (*Phascolarctos cinereus*) scratches and scats). Active searches were undertaken within suitable microhabitat at each habitat assessment site (i.e. across the broad range of habitat types throughout the Project Site). All fauna observed incidentally within or in near to the Project Site were recorded, including those seen while travelling along roads and tracks.	August 2016 October 2016 January 2017 March 2020
Habitat assessments	Habitat assessments were undertaken to characterise the fauna habitat values within the Project Site. These assessments provide an indication of likely fauna utilisation, and suitability for fauna species, including conservation significant fauna. Habitat attributes recorded during the assessment include: • vegetation structure and dominant species, including a description of canopy, shrub and ground layer structure and composition • presence and abundance of tree hollows and stags • presence and abundance of woody debris such as habitat logs and ground timber • presence and abundance of Koala (*Phascolarctos cinereus*) food trees • presence and abundance of soil cracks and Gilgai • rocky habitat such as surface rocks, boulders, crevices, overhangs and caves • proximity to water (both permanent and ephemeral) • disturbance from invasive weeds/pests • other disturbances such as grazing pressure, clearing, thinning or fire • any other significant habitat features or values present e.g. large nesting trees. Habitat assessments included searches for signs of animal activity, including tracks, scats, scratches, bones, fur, feathers, nests, foraging holes and diggings. At fauna habitat assessment locations, active searches, incidental observations and visual and auditory survey of birds (including for migratory birds where suitable conditions existed) were conducted.	November 2007 January 2010 April 2010 July 2011 August 2016 October 2016 January 2017 March 2020

Prior to each AECOM survey, potential fauna survey transect sites were identified during desktop studies and aerial photograph analysis, with the objective to target and characterise the key habitats across the site. Fauna survey sites are illustrated in Figure 4. A summary of each fauna survey undertaken across the Project Site is provided below.

2007 and 2010 Fauna survey (SKM)

SKM has undertaken two fauna surveys of MLA 70383 which encompasses the majority of the Project Site (with the exception of the proposed rail loading balloon loop, proposed CHPP, run-of-mine (ROM) pad, MIA, process water dam, raw water dam, product stockpiles and conveyor in the north-west of the Project Site). The first was completed between 12 November 2007 and 18 November 2007, and the

second between 7 April 2010 and 12 April 2010. The fauna survey programs comprised a combination of systematic survey at primary sites and less intensive opportunistic survey at secondary sites. The survey program was designed to census the terrestrial fauna assemblages and to identify conservation significant species that may occur within the Project Site.

The 2007 fauna survey was undertaken at four primary sites and six secondary sites (Figure 4) which were representative of the different habitat types across the Project Site. The 2010 fauna survey was undertaken at three primary sites and eight secondary sites (Figure 4) and focused on habitat within Lot 10 on CNS93 within the Project Site. The primary sites hosted the main effort and secondary sites were used to collect additional data, usually focusing on one or more fauna groups. The locations of the 2007 and 2010 survey sites are illustrated in Figure 4 and described in Table 6.

The 2010 fauna survey was conducted after the wet season due to prolonged wet weather preventing access until early April. Carfax weather station (22.46° S; 148.68° E; elevation 128 m), located approximately 30 km south-east of the Project Site, recorded 66.4 millimetres (mm) of rainfall in April 2010. Combined with overnight temperatures of around 20°C, these conditions were conducive to detection of fauna.

Table 6 2007 and 2010 Fauna Survey Sites

Site	Description
Primary Survey Sites	
2007	
1	*Eucalyptus populnea* woodland (RE 11.5.3)
2	Alluvium forest (RE 11.3.2/11.3.25/ 11.3.1) located along lower Boomerang Creek
3	*Eucalyptus tereticornis* woodland (RE 11.3.25) and *Eucalyptus populnea* woodland (11.5.3) located along Phillips Creek
4	*Acacia harpophylla* shrubby open forest (RE 11.4.9)
2010	
5	Boomerang Creek riparian woodland (RE 11.3.2/11.3.25/11.3.1) with *Eucalyptus camaldulensis*, *Melaleuca fluviatilis*, *Casuarina cunninghamiana* on alluvium
6	Oxbow wetland east (RE 11.3.27) with *Eucalyptus camaldulensis*, *Lophostemon grandiflorus* on alluvium
7	*Eucalyptus populnea* and *Casuarina cristata* woodland (RE 11.4.9) on brown clay
Secondary Survey Sites	
2007	
A	Alluvium forest (RE 11.3.2/11.3.25/ 11.3.1) located along upper Boomerang Creek
B	Alluvium forest (RE 11.3.2/11.3.25/ 11.3.1) located along upper Boomerang Creek
C	Dam and freshwater wetland surrounded by cleared land and scattered *Melaleuca* and *Eucalyptus tereticornis* located west of powerline easement in north-west of the Project Site
D	Dam surrounded by cleared grassland
E	*Acacia harpophylla* shrubby open forest (RE 11.4.9)
F	Alluvial forest. Located along Philips Creek
2010	
G	Wetland surrounded by RE 11.5.3 located south of the oxbow wetland
H	Dam surrounded by RE 11.4.9 with *Eucalyptus tereticornis*, *Acacia harpophylla*, *Lysiphyllum hookeri*, *Ventilago viminalis* and *Casuarina cristata*
I	Oxbow wetland west (RE 11.3.27) with *Eucalyptus camaldulensis*, *Lophostemon grandiflorus* on alluvium
J	Plumtree Creek riparian woodland (RE 11.3.2/11.3.25/11.3.1)

Site	Description
K	Phillips Creek riparian woodland (RE 11.3.25) with *Eucalyptus camaldulensis*, *Casuarina cunninghamiana*, *Corymbia tessellaris* and *Ficus opposita* on alluvium
L	Brigalow woodland (RE 11.4.9/11.4.8) with *Acacia harpophylla*, *Eucalyptus cambageana*, *Lysiphyllum carronii*
M	Belah woodland (RE 11.4.9/11.4.8) with *Casuarina cristata*, *Eucalyptus cambageana* and *Corymbia dallachiana*
N	Belah woodland (RE 11.4.9/11.4.8)

The survey techniques comprised live trapping (Elliot, cage, pitfall and harp traps), bat call detection (Anabat), bird and herpetofauna searches, spotlight searches and call broadcast. Most of these techniques were employed at the primary sites, and only searches or call broadcast used at the secondary sites. The range of survey techniques employed at each site is summarised in Table 7.

Table 7 Summary of 2007 and 2010 Fauna Survey Techniques

Fauna Survey Site	Elliot traps	Cage traps	Harp traps	Pitfall traps	Bird surveys	Spot-lighting searches	Anabat	Call Playback	Herpeto-fauna searches
1	X	X		X	X	X	X		X
2	X	X	X	X	X	X	X		X
3	X	X	X	X	X	X	X	X	X
4	X	X		X	X	X	X		X
5	X		X	X	X	X	X		X
6	X		X	X	X	X	X		X
7	X				X	X			X
A						X		X	
B									X
C					X				X
D					X				
E						X			
F					X				
G					X				
H					X	X			
I			X			X	X		
J			X						
K			X		X	X	X		
L									X
M						X			X
N						X	X		

2010 targeted survey (SKM)

A targeted survey for the Ornamental Snake (*Denisonia maculata*) was completed on 27 January 2010 and 28 January 2010. Two observers used a combination of vehicle and foot traverses within the Project Site. Vehicle traverses involved driving slowly (around 40 km per hour) along established tracks, whilst foot traverses involved walking slowly through suitable habitats not accessible by vehicle. All snakes encountered were identified and recorded and opportunistic sightings of other fauna were recorded.

Conditions for the targeted survey were good with substantial rainfall occurring over the Project Site in early January 2010. Carfax weather station recorded 141.5 mm of rainfall prior to the targeted survey. Combined with overnight temperatures of 19°C to 24°C, these conditions were ideal for detection of Ornamental Snake (*Denisonia maculata*).

2011 Winter surveys (SKM)

SKM undertook a winter fauna survey of MLA 70383 between 4 July 2011 and 8 July 2011. The survey consisted of morning bird surveys at wetland habitats (i.e. dams, creeks, wetlands), diurnal herpetofauna searches in *Acacia harpophylla* (Brigalow) and *Casuarina cristata* (Belah) habitats and bat call detection (Anabat). The purpose of the survey was to detect fauna over the dry, winter season and to search for possible migratory fauna utilising the area during the winter months.

2016 and 2017 Biodiversity surveys (AECOM)

The AECOM 2016 and 2017 surveys targeted the entire Project Site and included observations of terrestrial vertebrate fauna assemblages (birds, mammals, reptiles and amphibians), habitat assessments and Anabat deployment.

Survey tasks undertaken included:

- targeted early morning bird surveys within suitable habitat
- fauna observations and active searches at all flora transect locations
- habitat assessments targeted at conservation significant species potentially occurring within the Project Site
- observations and analysis of fauna scats as an indication of fauna utilisation
- spotlighting searches
- scans of the canopy and shrub layer for nests, hollows and arboreal fauna
- microchiropteran bat call detection (Anabat).

Detailed fauna habitat assessments were conducted at 8 sites (Figure 4), while an assessment of habitat suitability for conservation significant fauna species was conducted at 62 flora sites (Figure 3).

In addition, fauna observed incidentally during site traverses were recorded with habitat type in which they were observed. The location of fauna survey sites are depicted in Figure 4.

2020 targeted fauna surveys (AECOM)

Commonwealth survey guidelines provide a recommended standardised method of collecting ecological data, generally across smaller sized project sites (i.e. < 50 ha). To meet Commonwealth survey guidelines, a supplementary assessment of the entire Project Site was completed in March 2020 for the following threatened species:

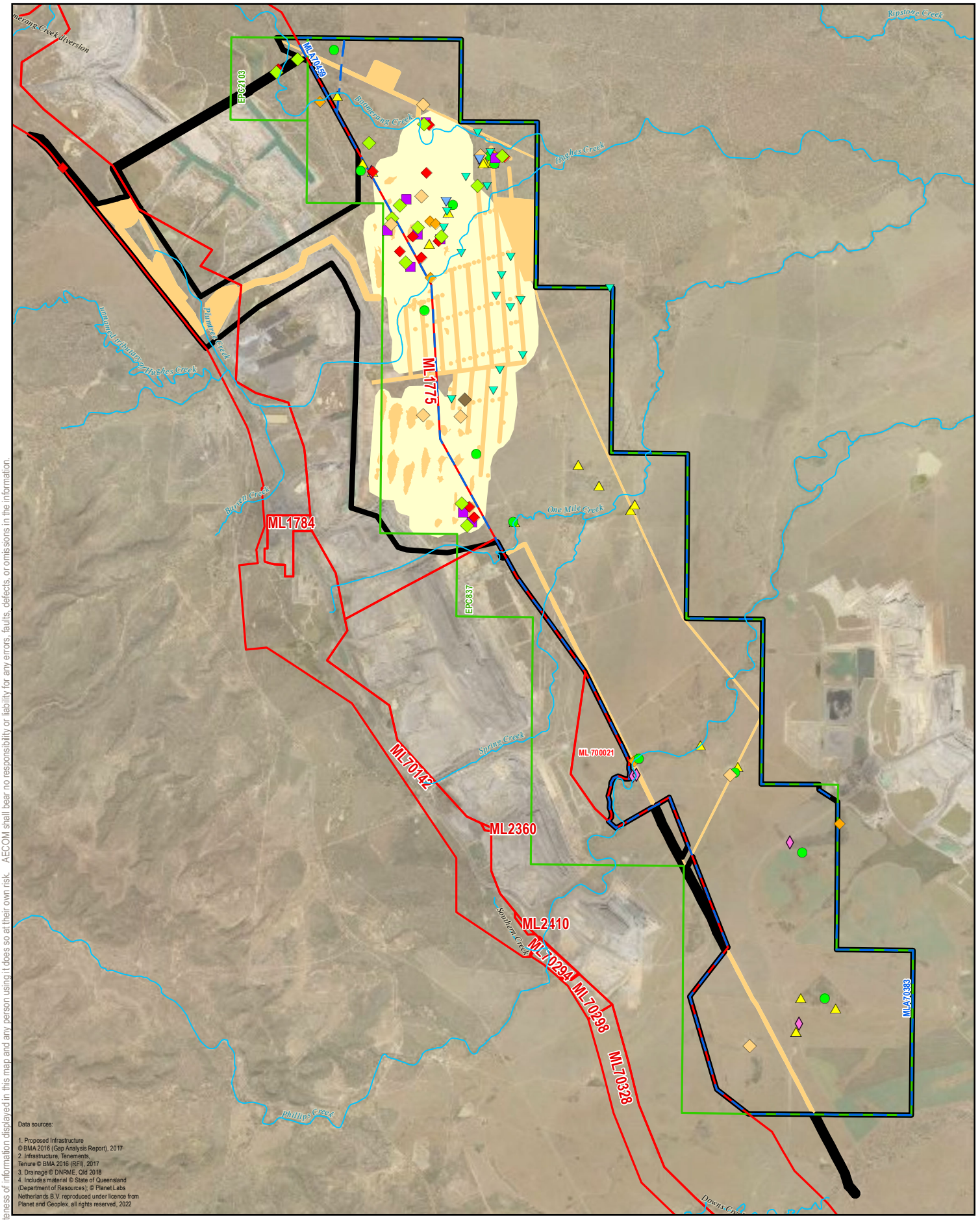
- Dunmall's Snake (*Furina dunmalli*)
- Yakka Skink (*Egernia rugosa*)
- Ornamental Snake (*Denisonia maculata)*
- Adorned Delma (*Delma torquata*)
- Koala (*Phascolarctos cinereus*)
- Greater Glider (*Petauroides volans*)

- Latham's Snipe (*Gallinago hardwickii*)
- Australian Painted Snipe (*Rostratula australis*)
- Painted Honeyeater (*Grantiella picta*)
- Red Goshawk (*Erythrotriorchis radiatus*)
- Squatter Pigeon (southern) (*Geophaps scripta scripta*)

Survey tasks undertaken included:

- active bird searches
- flushing surveys
- driving transects
- targeted habitat assessments (bird, mammals and reptiles)
- incidental bird surveys
- spotlighting
- active diurnal searches (mammals and reptiles)

Detailed assessment of habitat suitability for conservation significant fauna species was conducted at 72 flora sites (Figure 3).



Data sources:

1. Proposed Infrastructure © BMA 2016 (Gap Analysis Report), 2017
2. Infrastructure, Tenements, Tenure © BMA 2016 (RFI), 2017
3. Drainage © DNRME, Qld 2018
4. Includes material © State of Queensland (Department of Resources); © Planet Labs Netherlands B.V. reproduced under licence from Planet and Geoplex, all rights reserved, 2022

Legend

- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Site
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Fauna survey sites

- General habitat assessment (AECOM 2017)
- Yakka Skink habitat assessment (AECOM 2020)
- Squatter Pigeon habitat assessment (AECOM 2020)
- Greater Glider habitat assessment (AECOM 2020)
- Active fauna search (AECOM 2020)
- Spotlight location (AECOM 2020)
- Spotlight location (AECOM 2017)
- Anabat location (AECOM 2017)
- Winter site (SKM)
- Primary site (SKM)
- Secondary site (SKM)

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Figure 4
Fauna survey sites

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

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3.3 Likelihood of occurrence assessment

A likelihood of occurrence assessment for threatened and migratory species and TECs identified during the desktop review was undertaken. Targeted searches were undertaken in the field for species identified as either being likely to occur, or having potential to occur, within the Project Site, based on the desktop sources. The methodology was applied again after field surveys to determine the likelihood of occurrence once site-based information became available.

Each species was assessed against the categories defined below.

- **Known:** Species was positively identified and recorded in the Project Site during the field surveys; or previous, reliable records occur within the Project Site.
- **Likely:** Species was not recorded during the field surveys or previously, however there are known records within the nearby surrounding area (i.e. 15 km) and suitable habitat exists in the Project Site.
- **Potential:** Species was not recorded during the field surveys or previously, however known records occur in the surrounding area (i.e. 15 km) and habitat in the Project Site is marginal or degraded.
- **Unlikely:** Habitat in the Project Site might be suitable or marginal; however, species was not recorded during the field surveys, and no known records of the species exist within the surrounding area (i.e. 15 km).
- **No:** This is usually applied to marine species or seabirds for terrestrial sites.

3.4 Potential Habitat Mapping

Following the completion of field surveys and the likelihood of occurrence assessment, habitat mapping for the MNES and MSES values known or considered likely to occur within the Project Site was undertaken. MNES and MSES potential habitat mapping of the Project Site was undertaken to:

- estimate the extent of potential habitat present within the Project Site
- inform the potential impacts to MNES and MSES values
- aid the development of specific mitigation measures.

Potential habitat mapping was undertaken in accordance with Central Queensland Threatened Species Habitat Descriptions (Kerswell A, Kaveney T, Evans C and Appleby L, 2020). This covers some of the key threatened fauna species of the Central Queensland region and defines habitat based on three categories – preferred, suitable and marginal habitat. The definitions of each category are provided in Table 8 below. Preferred habitat definitions have been provided for all species but not all species have been allocated both a suitable and marginal habitat category. Allocation of these categories was based on the known ecological requirements of the species and the most applicable category that best describes the species habitat.

For species not covered by Central Queensland Threatened Species Habitat Descriptions (Kerswell A, Kaveney T, Evans C and Appleby L, 2020), habitat definitions were developed from information sourced from publicly available databases, including relevant species recovery plans (where available), referral guidelines, approved conservation advice, the Species Profile and Threats database (SPRAT), management plans and peer-reviewed journal articles.

Habitat assessment information collected during the field surveys, species records (historic and contemporary survey records), and Project vegetation mapping was used to map the potential habitat according to the habitat definitions.

Table 8 Habitat category definitions

Habitat Category	Definition
Preferred	Habitats that are most important to the species and contain the features that are crucial for the species' persistence in an area. It includes habitats in which key activities are undertaken e.g. breeding, roosting and/or where high quality/species limiting foraging resources are found. If the species is present in a region, individuals will usually be found in preferred habitat.
Suitable	Habitats that provide resources for the species but is not crucial for its persistence in an area. Individuals may be found in suitable habitat but are not likely to be undertaking key activities such as breeding or roosting. Foraging resources may be lower quality or used opportunistically (rather than being depended upon). If the species is present in a region, individuals may be found in suitable habitat but this habitat type may also remain unoccupied.
Marginal	Habitats that provide limited resources for the species and is not crucial for its persistence in an area. Individuals may be occasionally found in marginal habitat but will not be undertaking key activities such as breeding, roosting or extensive foraging. If the species present in a region, individuals would be found in marginal habitat only rarely and this habitat type is likely to be unoccupied most of the time.

3.5 Significant Impact Assessment

A significant impact assessment in accordance with the criteria provided in the Significant Residual Impact Guidelines (Department of the Environment and Heritage Protection, 2014) has been undertaken for the Project on MSES identified within the Project Footprint. Assessment of impacts for MSES Regulated Vegetation and Connectivity Areas has been undertaken using the DoR (2022a) Vegetation Management Regional Ecosystem mapping (Version 12.0).

Assessment of potential significant impacts on MNES is addressed in a standalone assessment within the EIS (BMA, 2024). However, further information can also be found in Section 11.0 of this report.

4.0 Terrestrial flora results

4.1 Literature review results

4.1.1 Regional context

Bioregion

The Project Site is situated within the northern Brigalow Belt bioregion. Queensland's bioregions are based on landscape patterns that reflect changes in geology and climate, as well as major changes in floral and faunal assemblages at a broad scale and are used as the fundamental framework for the planning and conservation of biodiversity.

Major impacts upon vegetation of the Brigalow Belt include tree clearing, high grazing pressure and the proliferation of exotic species such as the Prickly Pear (*Opuntia spp*.*). As a consequence of habitat modification, many flora and fauna species have undergone severe range reductions and localised extinctions have occurred for several fauna species (Sattler and Williams, 1999).

Vegetation clearing has occurred on most of the lowland landscapes and those formed on shales. The more rugged topography associated with the sandstone and metamorphic ranges remain relatively undisturbed (Sattler and Williams, 1999).

Subregion

The Brigalow Belt bioregion contains 36 subregions that delineate significant differences in geology and geomorphology (Sattler and Williams, 1999). The Project Site is situated within the Isaac – Comet Downs subregion. The landscape of this bioregion is predominantly undulating country dominated by *Acacia harpophylla* (Brigalow) and *Eucalyptus cambageana* (Dawson Gum) communities on clay soils and *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus populnea* (Poplar Box) open woodland communities on the shallower textured-contrast soils. *Acacia harpophylla* (Brigalow) and *Eucalyptus coolabah* (Coolabah) woodlands are common on alluvium which is commonly encountered in this subregion (Sattler and Williams, 1999).

4.1.2 Remnant and high value regrowth regional ecosystems

State RE mapping was reviewed to determine the extent of REs across the Project Site. Twelve REs are mapped as occurring within the Project Site; these are listed in Table 9 and shown on Figure 5 and Figure 6 (VM Act Status). The REs are predominantly associated with the creeks that drain across the properties as remaining areas have largely been cleared. Based on the Biodiversity Status classifications, three REs are listed as endangered, five as of concern and four as no concern at present. The EPBC Act status refers to the status of the TEC which may be associated with the RE listed in Table 9. Five of the REs are also component REs of endangered ecological communities listed under the EPBC Act.

State mapping was also consulted to determine the extent of HVR within the Project Site. HVR occurs in several small patches which have not been cleared for greater than 15 years. These are outlined in Table 10.

Table 9 DoR mapped regional ecosystems

Regional Ecosystem	Description[1]	Biodiversity Status[2]	VM Act Status[3]	EPBC Act Status[4]
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Of Concern	Of Concern	Endangered (when condition thresholds and diagnostic criteria are met)
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Of Concern	Least Concern	-
11.3.27b	Freshwater wetlands	Of Concern	Least Concern	-
11.3.37	*Eucalyptus coolabah* fringing woodland on alluvial plains	No Concern at Present	Least Concern	-
11.4.4	*Dichanthium* spp., *Astrebla* spp. grassland on Cainozoic clay plains	Of Concern	Least Concern	Endangered (when condition thresholds and diagnostic criteria are met)
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)
11.4.13	*Eucalyptus orgadophila* open woodland on Cainozoic clay plains	Of Concern	Least Concern	-
11.5.3	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces	No Concern at Present	Least Concern	-
11.5.9b	*Eucalyptus crebra, E. tenuipes, Lysicarpus angustifolius* +/- *Corymbia* spp. woodland	No Concern at Present	Least Concern	-
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland on fine-grained sedimentary rocks	No Concern at Present	Least Concern	-

[1] Description of REs as contained in the REDD Version 12.1 (Queensland Herbarium, 2021).

[2] Biodiversity status of the RE based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem.

[3] Conservation status of the RE under the Queensland VM Act.

[4] Conservation status of the TEC for which the RE is analogous at the time of the Project EPBC Act referral. RE must meet the condition thresholds and diagnostic criteria to be considered TEC.

Table 10 DoR mapped high value regrowth Regional Ecosystems

HVR – Regional Ecosystem	Description[1]	Biodiversity Status[2]	VM Act Status[3]	EPBC Act Status[4]
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Of Concern	Of Concern	Endangered (when condition thresholds and diagnostic criteria are met)
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Of Concern	Least Concern	-
11.3.37	*Eucalyptus coolabah* fringing woodland on alluvial plains	No Concern at Present	Least Concern	-
11.4.4	*Dichanthium* spp*., Astrebla* spp. Grassland on Cainozoic clay plains	Of Concern	Least Concern	Endangered (when condition thresholds and diagnostic criteria are met)
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)
11.4.13	*Eucalyptus orgadophila* open woodland on Cainozoic clay plains	Of Concern	Least Concern	-
11.5.3	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces	No concern at present	Least Concern	-
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland to open woodland on fine-grained sedimentary rocks	No concern at present	Least Concern	-

[1] Description of REs as contained in the REDD Version 12.1 (Queensland Herbarium, 2021).

[2] Biodiversity status of the RE based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem.

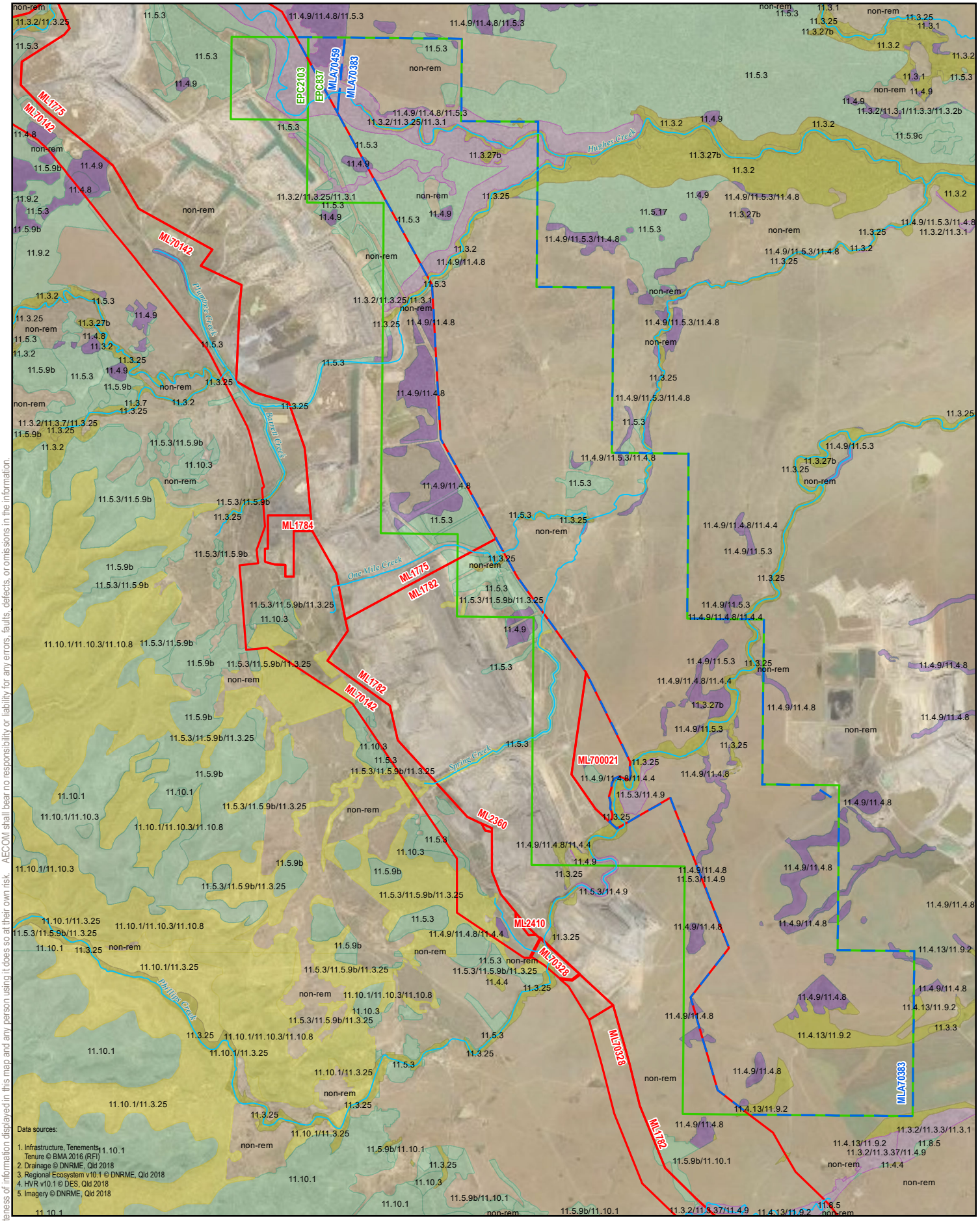
[3] Conservation status of the RE under the VM Act.

[4] Conservation status of the TEC at the time of the for which the RE is analogous. RE must meet the condition thresholds and diagnostic criteria to be considered TEC.

4.1.3 Essential habitat

The Essential Habitat mapping shows vegetation which is known to support Essential Habitat values for particular conservation significant species, or habitat which surrounds point records of conservation significant species.

A total of 2,022.81 ha of Essential Habitat is mapped for two conservation significant fauna species within the Project Site (see Section 5.1.1). Essential Habitat for Squatter Pigeon (*Geophaps scripta scripta*) and Ornamental Snake (*Denisonia maculata*) is mapped based on species habitat models and suitable habitat surrounding previous records of this species. Approximately 724.23 ha of Essential Habitat is located within the Project Footprint.



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LEGEND

- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Watercourse

Biodiversity Status Regional Ecosystems

- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- No concern at present

N

Figure 5
State Mapped Regional Ecosystems Biodiversity Status (DNRME Version 12.02)
Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

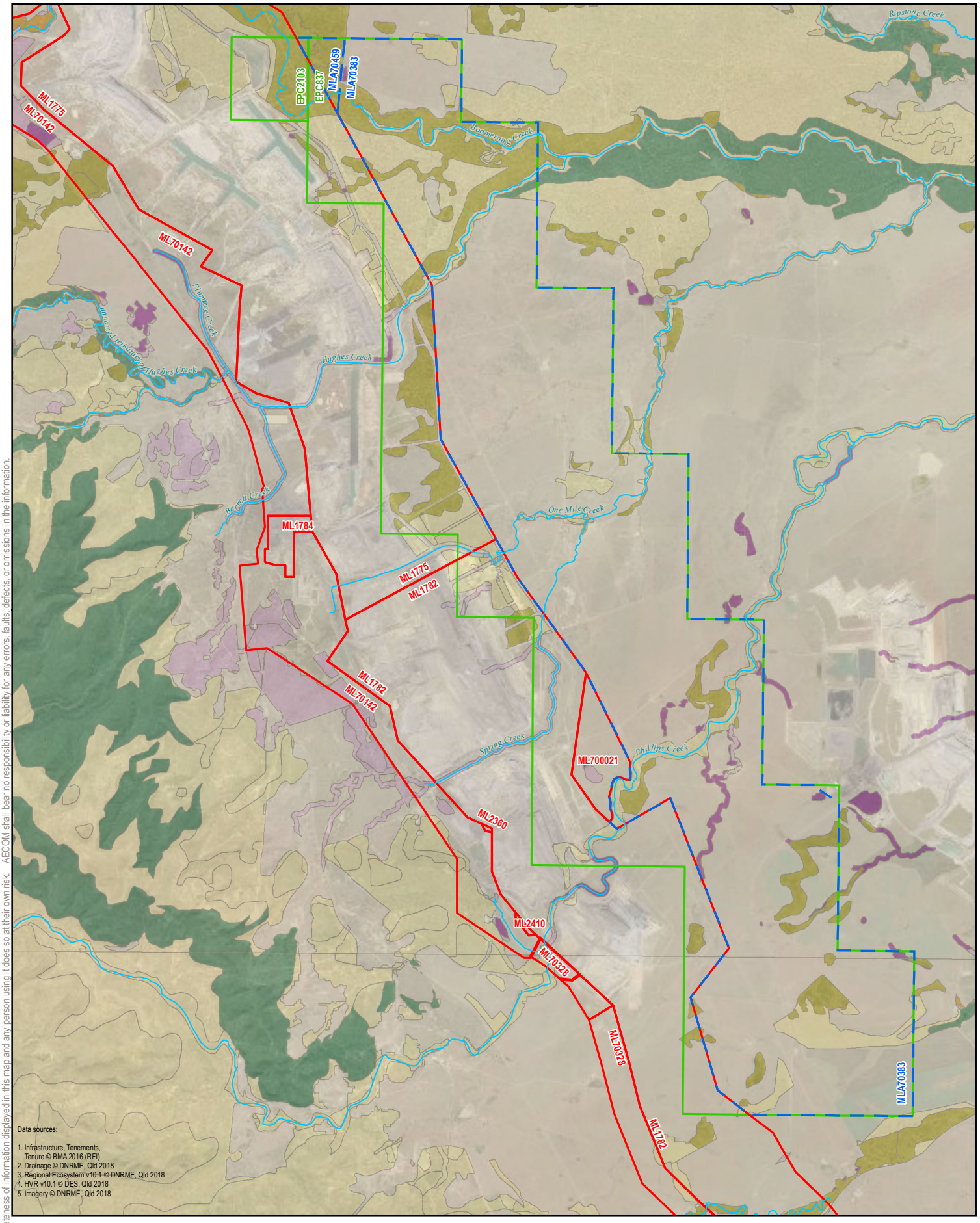
Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)

Vegetation Management Act Regional Ecosystem Classes

- Remnant - Endangered
- Remnant Of Concern
- Remnant - Least Concern
- High Value Regrowth - Endangered
- High Value Regrowth - Of Concern
- High Value Regrowth - Least Concern
- Non-remnant

N

Figure 6
State Mapped Regional Ecosystems VM Act Status (DNRME Version 12.02)
Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

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4.1.4 Threatened ecological communities

A review of the EPBC Act PMST determined that four EPBC Act-listed TECs are potentially occurring within the Project Site. The list of ecological communities and likelihood of occurrence is presented in Table 11.

Table 11 EPBC Listed threatened ecological communities potentially occurring within the Project Site

Ecological Community	EPBC Act Status	Description	Likelihood of Occurrence
Brigalow (Acacia harpophylla dominant and codominant)	Endangered	*Acacia harpophylla* (Brigalow) is a distinctive silver-foliaged shrub or tree dominant or co-dominant in open forests or woodlands within Queensland and NSW.	**Known.** This TEC corresponds to REs that have been identified within the Project Site by Queensland Government mapping and confirmed during field surveys.
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered	Native tussock grasslands typically composed of a mixture of forbs (i.e. herbs that are broad-leaved and not grass-like) and native grasses that usually occur where fine grained sedimentary rocks occur on alluvial plains, flat ground or gently undulating rises in subtropical climate.	**Known.** This TEC has been identified by SKM within the Project Site and confirmed by AECOM during biodiversity surveys in 2016.
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Dry seasonal subtropical rainforest on medium-high fertility soils, generally characterised by the prominence of vines, twining or scrambling plants on mixed evergreen, semi-evergreen and deciduous tree species with microphyll sized leaves (2.5–7.5cm long) and the frequent presence of Swollen-stemmed “Bottle Trees” (Brachychiton australis, B. rupestris) as emergents from the vegetation.	**Unlikely.** REs analogous to this TEC have not been mapped by DES within the Project Site and the TEC was not identified during ecological surveys.
Weeping Myall Woodlands	Endangered	Open, shrubby or grassy woodland in which Weeping Myall (Acacia pendula) trees are the sole or dominant overstorey species with understorey comprising an open layer of shrubs above an open ground layer of grasses and herbs.	**Unlikely.** Potential RE (RE 11.3.2) containing the TEC was mapped by DES within the Project Site, however it was not identified through ecological surveys.

4.1.5 Flora of conservation significance

Seven conservation significant flora species listed under the EPBC Act and/or NC Act were identified from desktop searches as potentially occurring within the Project Site. A likelihood of occurrence assessment was conducted for each of these species to determine which species are known, likely, potential, unlikely or no possibility to occur within the Project Site. This evaluation is based on an understanding of the preferred habitats of the species, knowledge of the type and condition of habitats present at the Project Site, and the results of the SKM flora surveys. The results of this likelihood assessment are presented in Table 12.

Of those seven species, previous field surveys undertaken by SKM confirmed the presence of one: *Dichanthium setosum* (Bluegrass), which is listed as vulnerable under the EPBC Act. *Dichanthium setosum* (Bluegrass) was recorded south of Phillips Creek (Figure 7) where it was observed as one of the dominant species within RE 11.4.4 (*Dichanthium* spp*., Astrebla* spp*.* Grassland on Cainozoic clay plains*)* which forms part of the *Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC. This vegetation also represents high potential habitat (Figure 8) for another species, *Dichanthium queenslandicum* (King Bluegrass), which is considered a likely occurrence. However, the DES and ALA 2023 have no records of King Bluegrass occurring within Figure 8 map extent. No other EPBC Act or NC Act listed flora species were recorded during the field surveys.

The full list of database search results is provided in Appendix A.

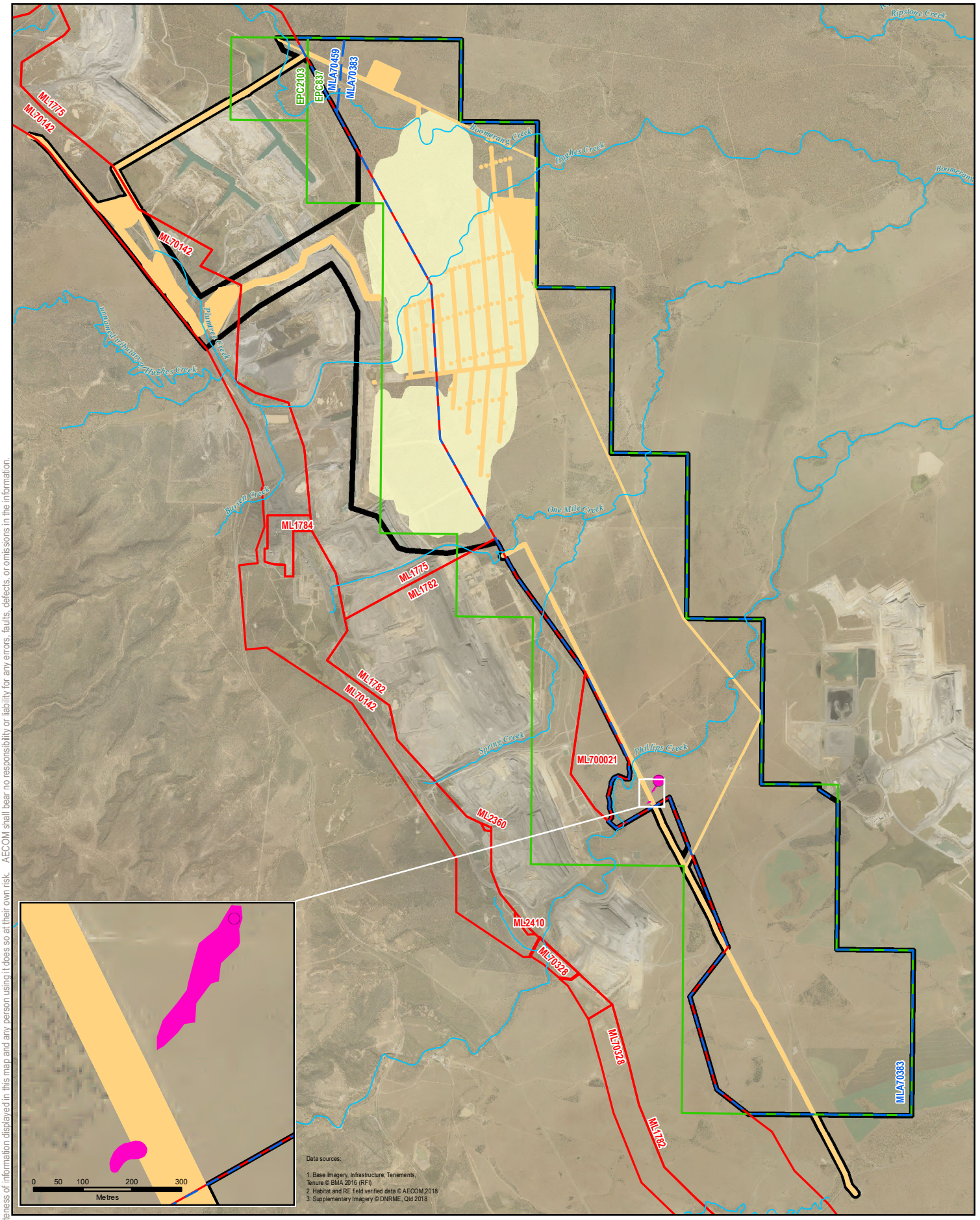
Table 12 Likelihood of occurrence for Conservation Significant flora species within the Project Site

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/Distribution	Likelihood of occurrence
Aristida annua	-	V	V	Annual grass growing up to approximately 50 centimetres (cm) in height Occurs in eucalypt woodland and is restricted to black clay soils and basalt soils. Occurs in the Natural Grasslands of the *Queensland Central Highlands and the northern Fitzroy Basin* TEC.	**Potential** Suitable habitat within natural grassland habitat within the Project Site.
Cadellia pentastylis	Ooline	V	V	Ooline is a medium-sized spreading tree typically growing to 10m high, but occasionally up to 25m. It's distribution is from the NSW north-west slopes to Carnarvon Range and the Callide Valley in Queensland. Ooline occurs within dry rainforest, semi-evergreen vine thickets and sclerophyll communities.	**Unlikely** Ooline is a large, conspicuous species which is unlikely not to have been identified during previous field surveys. No records are available within the area.
Cerbera dumicola	-	-	NT	*Cerbera dumicola* occurs across a range of habitats in central and southern Queensland. Associated vegetation and species include: sandstone hills in open *E. umbra* subsp. *carnea*; on plateaus, in woodland of *Acacia shirleyi* with *Corymbia dolichocarpa*; acidic soils in mine rehabilitation area; woodland of *A. catenulata* and *A. shirleyi* with *E. thozetiana* on a slope of sand/clay soil; semi-deciduous notophyll-microphyll vine forest of *Brachychiton australis*, *Gyrocarpus americanus*, *Flindersia australis*, *Pleiogynium timorense*, *Drypetes deplanchei* and *Sterculia quadrifida* on rhyolite hillslopes; open-woodland of *E. melanophloia* with occasional *Acacia shirleyi*, *E. populnea* and *E. brownii*; semi-evergreen vine thicket with *Corymbia citriodora* and *Corymbia aureola* emergents; woodland of *A. rhodoxylon* on brown, sandy loam; and in *Corymbia tessellaris – Acacia aneura* open woodland.	**Potential** Some marginal habitat is available in *Eucalyptus populnea* (Poplar Box) woodlands, however no known vegetation associations are present. A record is available from approximately 7 km west of the Saraji Mine complex.
Cycas ophiolitica	-	E	E	*C. ophiolitica* Occurs from Marlborough to the Fitzroy River near Rockhampton, in woodland or open woodland	**Unlikely** No suitable habitat within the Project site.

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/Distribution	Likelihood of occurrence
				dominated by eucalypts, often on serpentinite substrates (Queensland Herbarium, 2007).	
Dichanthium setosum	Bluegrass	V	-	An upright Bluegrass less than 1 m tall. Associated with heavy basaltic black soils and found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture. In Queensland, its distribution includes the Leichhardt, Moreton, North Kennedy and Port Curtis regions (TSSC, 2008b).	**Known** *Dichanthium setosum* (Bluegrass) was recorded within RE 11.4.4 in the south of the Project Site (Figure 7). This was found to be a dominant species within this vegetation community.
Dichanthium queenslandicum	King Bluegrass	E	V	A perennial grass growing to 80 cm in height. Occurs on black cracking clay in tussock grasslands. Mostly occurs in natural bluegrass grasslands including the TEC Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin TEC which occurs within the Project Site.	**Likely** Suitable habitat within natural grassland habitat within the Project Site (Figure 8).
Samadera bidwillii	Quassia	V	V	*Samadera bidwillii* (Quassia) is a small tree or shrub that is endemic to Queensland. It is distinguished by its red floral clusters (November to March), slender flower stalks and smooth red fruits (February to April). Branchlets are ribbed with fine, pale brown hairs. Leaves are stiff, narrowly elliptical and leathery with a glabrous upper surface and sparsely hairy lower surface. It commonly occurs in rainforest margins, low land rainforest with a canopy dominated by *Araucaria cunninghamii* (Hoop Pine) or open eucalypt forests in moist areas such as creek lines and riverbanks and in locations up to 510 m. The species can also occur on ridges and disturbed habitats such as roadside vegetation.	**Unlikely** The Project Site does not fall within the known distribution of this species and the species was not recorded during previous ecological surveys.

[1] Conservation status under the EPBC Act: E (endangered), V (vulnerable) at the time of the Project EPBC Act referral.

[2] Conservation status under the NC Act: E (endangered), V (vulnerable), NT (near threatened)



LEGEND

- Project Site
- Project Footprint - Construction
- Project Footprint - Operation
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Watercourse

Threatened flora record and known habitat

- Natural grassland habitat
- Bluegrass

N

Figure 7

Bluegrass known habitat within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

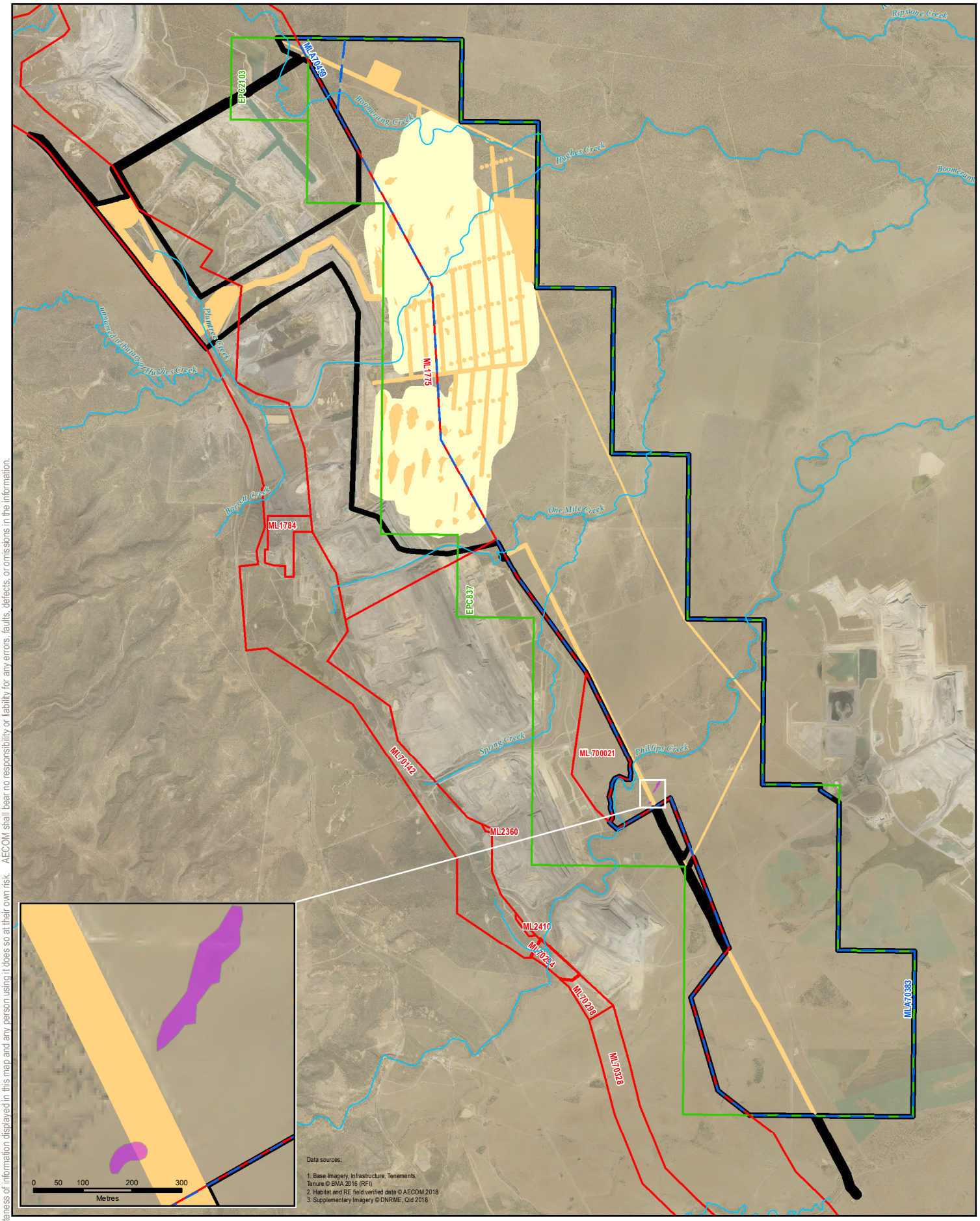
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Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

High potential habitat

- Remnant grassland habitat

N

Figure 8

King bluegrass potential habitat within the Project Site

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Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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4.2 Field survey results

This section documents the results of the detailed field surveys of the flora and vegetation communities of the Project Site, undertaken by AECOM in 2016, 2017 and 2020 and includes a summary of species diversity, remnant and regrowth REs, conservation significant flora, condition of grasslands and weeds of concern. A complete list of all taxa identified is provided in Appendix B.

The field assessment of the survey area was carried out using the methodology outlined in Section 3.2. The sites surveyed are depicted in Figure 3.

The seasonal weather conditions for the four AECOM survey periods are detailed below in Table 13.

Table 13 Weather observed during survey periods

Survey Timing	Temperature		Rainfall	
	Minimum (°C)	Maximum (°C)	During Survey (mm)	Month prior to survey (mm)
27 August 2016 to 29 August 2016	4.4	25.6	0.0	10.0 (all fell on 25 August 2016)
6 October 2016 to10 October 2016	9.8	32.9	0.0	14.2 (3.2 fell on 4 October 2016)
30 January 2017 to 3 February 2017	20.6	37.7	0.0	60.2 (3.6 fell on 14 January 2017)
20 to 23 March 2020	15.6	33.4	0.4	76.4 (20.0 fell on 24 February 2020)

4.2.1 Regional ecosystems

Ten REs were described and mapped in the Project Site on the basis of stereo pair aerial photo, geology mapping and analysis and field survey results (Figure 9). Of the REs described, three are listed as endangered, six as of concern and one as least concern as per the Biodiversity Status. Table 14 provides a summary of the classification of vegetation communities and REs identified during the flora surveys.

Vegetation communities for the survey areas have been delineated on the basis of REs. The flora surveys confirmed the State RE mapping at the time of survey fairly represents the RE types and distribution in the Project Site. One additional RE was observed, RE 11.4.4 *Dichanthium* spp*., Astrebla spp*. Grassland on Cainozoic clay plains, which occurs south of Phillips Creek. Three REs, 11.3.37, 11.5.9 and 11.9.2, were mapped as heterogeneous polygons in the north-west of the Project Site however these have been excluded based on field verification. The extent, condition, dominant species and conservation significance of each RE is described below, with representative site photographs. Exotic species are denoted with an asterisk (*).

4.2.2 High value regrowth

HVR was not mapped by AECOM due to not being regulated under the VM Act at the time of survey.

Legislative amendments in 2018 have reverted back to regulating HVR as Category C under the *Vegetation Management and Other Legislation Amendment Act 2018* (VMOLA). As such HVR within the Project Site has been quantified, despite the Project not requiring assessment against the VMOLA or VM Act.

The DoR RE mapping version 12.0 has been used to calculate extent of HVR within the Project Site and Project Footprint, with no field verification undertaken. Areas are provided in Table 15 below.

Table 14 Observed Regional Ecosystems within the Project Site

RE	Community Description[1]	Biodiversity Status[2]	VM Act Class[3]	EPBC Act[4]	Project Site Extent (ha)	Project Footprint (ha)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)	15.76	6.58
11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Of Concern	Of Concern	Listed as endangered after submission	151.15	65.51
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus spp.* Woodland on alluvial plains.	Of Concern	Of Concern	Not Listed	23.05	0.01
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Of Concern	Least Concern	Not listed	163.65	61.00
11.3.27b	Lacustrine wetland (e.g. lake). Vegetation ranges from open water +/- aquatics and emergents such as *Potamogeton crispus, Myriophyllum verrucosum, Chara* spp., *Nitella* spp., *Nymphaea violacea, Ottelia ovalifolia, Nymphoides indica, N. crenata, P. tricarinatus, Cyperus difformis, Vallisneria caulescens and Hydrilla verticillata*. Often with fringing woodland, commonly *Eucalyptus camaldulensis* or *E. coolabah* but also a wide range of other species including *E. platyphylla, E. tereticornis, Melaleuca* spp., *Acacia holosericea* or other *Acacia* spp. Occurs on billabongs no longer connected to the channel flow.	Of Concern	Least Concern	Not listed	7.05	1.89
11.4.4	*Dichanthium* spp., *Astrebla* spp. Grassland on Cainozoic clay plains.	Of Concern	Least Concern	Endangered (when condition thresholds and diagnostic criteria are met)	1.73	0.08

RE	Community Description[1]	Biodiversity Status[2]	VM Act Class[3]	EPBC Act[4]	Project Site Extent (ha)	Project Footprint (ha)
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)	322.35	222.45
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains.	Endangered	Endangered	Endangered (when condition thresholds and diagnostic criteria are met)	188.57	32.56
11.4.13	*Eucalyptus orgadophila* open woodland on Cainozoic clay plains.	Of Concern	Least Concern	Not listed	222.14	38.03
11.5.3	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces.	No concern at present	Least Concern	Not listed	0.55	0.02

[1]- Description of REs as contained in the Regional Ecosystem Digital Database (REDD).

[2]- Biodiversity status of the RE. The Biodiversity Status is based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem which is used to determine its class under the VM Act.

[3]- Conservation status of the RE under the Queensland VM Act.

[4]- Conservation status of the TEC for which the RE is analogous. RE must meet the condition thresholds and diagnostic criteria to be considered TEC.

Table 15 HVR Regional Ecosystems mapped by DoR within the Project Site

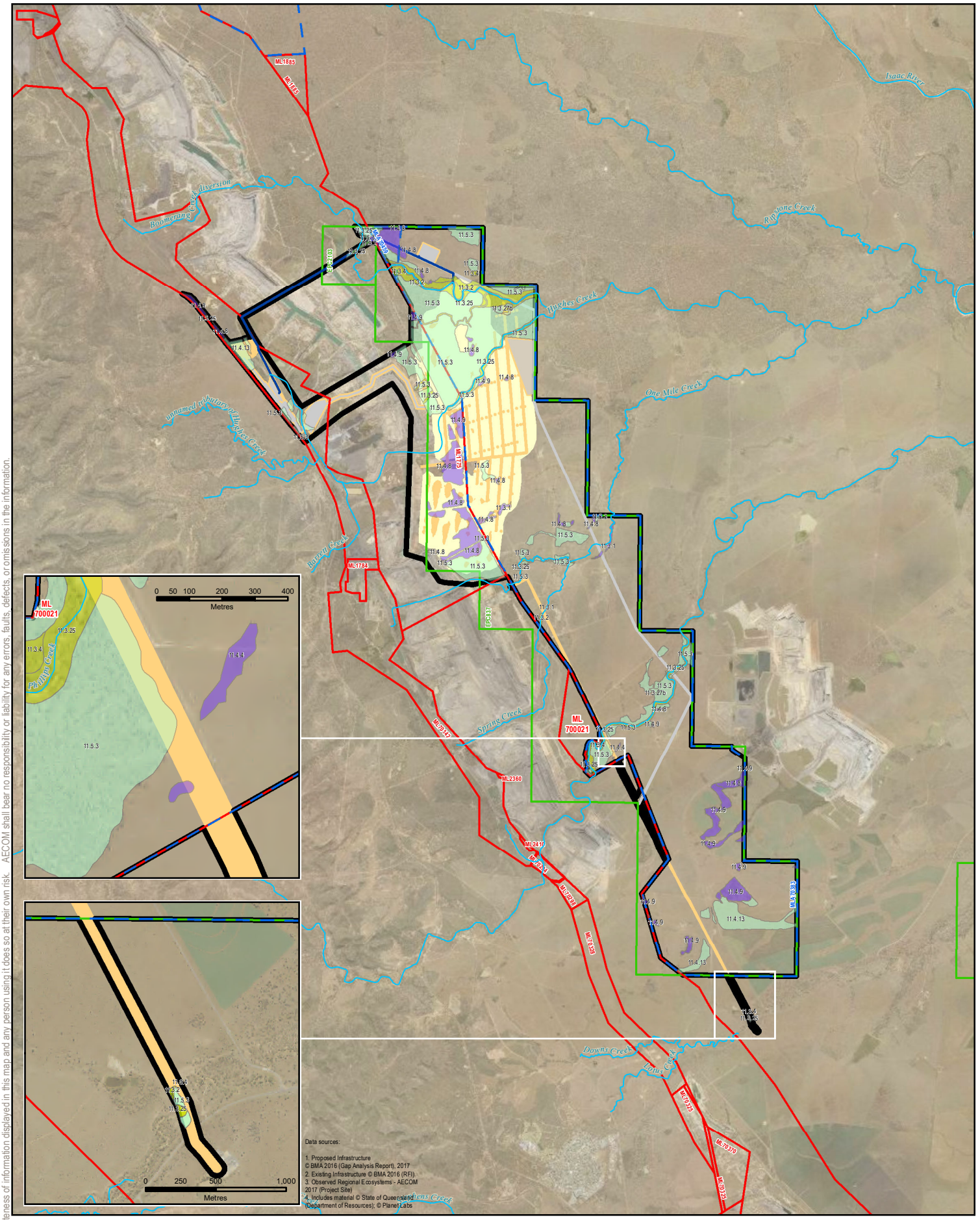
HVR RE	Description[1]	Biodiversity Status[2]	VM Act Status[3]	EPBC Act Status[4]	Project Site (ha)	Project Footprint (ha)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Endangered	Endangered	Endangered	0.30	0.10
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Of Concern	Of Concern	-	1.90	0.65
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Of Concern	Least Concern	-	26.68	7.01
11.3.37	*Eucalyptus coolabah* fringing woodland on alluvial plains	No Concern at Present	Least Concern	-	0.06	0.04
11.4.4	*Dichanthium* spp., *Astrebla* spp. Grassland on Cainozoic clay plains.	Of Concern	Least Concern	Endangered	2.23	0.01
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.	Endangered	Endangered	Endangered	37.94	1.21
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains.	Endangered	Endangered	Endangered	50.67	2.68
11.4.13	*Eucalyptus orgadophila* open woodland on Cainozoic clay plains.	Of Concern	Least Concern	-	0.03	-
11.5.3	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces.	No concern at present	Least Concern	-	27.13	2.04
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland to open woodland on fine-grained sedimentary rocks.	No concern at present	Least Concern	-	0.02	-

[1]- Description of REs as contained in the Regional Ecosystem Digital Database (REDD).

[2]- Biodiversity status of the RE. The Biodiversity Status is based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem which is used to determine its class under the VM Act.

[3]- Conservation status of the RE under the Queensland VM Act.

[4]- Conservation status of the RE as an analogous TEC under the EPBC Act.



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Surface Infrastructure
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Pipeline
- Watercourse

Regional Ecosystem biodiversity status

- Endangered
- Of Concern
- No Concern at Present

N

Figure 9
Ground-truthed regional ecosystems

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

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RE 11.3.1 *Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains

A small area of this RE fringes One Mile Creek east of the Project Site. This riparian woodland is dominated by *Acacia harpophylla* (Brigalow) with occasional *Casuarina cunninghamiana* (River She-oak) also present in the canopy layer. The shrub layer consisted of *Alectryon diversifolius* (Scrub Bonaree), juvenile *Acacia harpophylla* (Brigalow) and *Atalaya hemiglauca.*

The ground layer was predominantly bare (55 per cent - 90 per cent bare), with sparse ground cover including *Carissa ovata* (Currant Bush) the exotic grass *Cenchrus ciliaris** (Buffel Grass) and the weed of national significance (WoNS) *Parthenium hysterophorus** (Parthenium Weed).



Plate 1 RE 11.3.1 Fringing One Mile Creek

RE 11.3.2 *Eucalyptus populnea* woodland on alluvial plains

This RE was recorded within a small area on the alluvial plain surrounding Boomerang Creek in the north of the Project Site. Within RE 11.3.2, *Eucalyptus populnea* (Poplar Box) forms an open canopy with *Lysiphyllum carronii* (Queensland Ebony), *Cassia brewsteri* (Leichhardt Bean), *Acacia salicina* (Sally Wattle), and *Eremophila mitchellii* (False Sandalwood) scattered in the lower tree layers. The moderately dense ground layer is dominated by *Bothriochloa bladhii* (Forest Bluegrass) and *Cenchrus ciliaris**), with occasional *Themeda triandra* (Kangaroo Grass) and *Heteropogon contortus* (Black Speargrass).

RE 11.3.25 *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines

RE 11.3.25 occurs fringing the drainage lines of Boomerang Creek, Plumtree Creek, Hughes Creek, One Mile Creek and Phillips Creek.

Eucalyptus camaldulensis (River Red Gum) forms a tall canopy (between 16 m and 24 m in height), with *Casuarina cunninghamiana* (River She-oak), *Corymbia tessellaris* (Moreton Bay Ash) and *Melaleuca fluviatilis* present in the lower tree layers. The shrub layers include *Cassia brewsteri*

(Leichhardt Bean) and *Acacia salicina* (Sally Wattle). *Ficus opposita* (Sandpaper Fig) was present along Phillips Creek.

*Megathyrsus maximus** (Guinea Grass)*, Cynodon dactylon** (Couch)*, Chloris virgata* (Feathertop Rhodes Grass) and *Lomandra longifolia* (Mat Rush) are common in the ground layer. The community is disturbed by grazing, flooding, feral animals and weeds.



Plate 2 RE 11.3.25 *Eucalyptus tereticornis* or *Eucalyptus camaldulensis* woodland fringing drainage lines

RE 11.3.27b Lacustrine wetland

Two freshwater oxbow wetlands (RE 11.3.27b) occur in the north-east of the Project Site which comprises open water with aquatic species, fringing sedgeland and eucalypt woodland. The canopy comprises *Eucalyptus camaldulensis* (River Red Gum) and *Lophostemon grandifloras* (Northern Swamp Box) (between 16 m and 20 m in height), both species also present in the lower tree layer (between 8 m and 12 m in height), with a shrub layer of *Acacia salicina* (Sally Wattle) and *Xanthium pungens** (Noogoora Burr) and ground layer including *Cyperus spp.* and the aquatic grass species *Pseudoraphis spinescens*.



Plate 3 RE 11.3.27b in the north of the Project Site

RE 11.3.4 *Eucalyptus tereticornis* and/or *Eucalyptus spp.* Woodland on alluvial plains

This RE was located in two locations within the Project Site, in the north associated with Plumtree Creek and also in the south associated with Phillips Creek (Plate 4). This community comprises open woodland dominated by *Corymbia tessellaris* (Moreton Bay Ash). The shrub layer was sparse with species including *Corymbia tessellaris* (Moreton Bay Ash), *Clerodendrum floribundum, Acacia salicina* (Sally Wattle) and the WoNS *Lantana camara** (Lantana). The ground cover was close to 100 per cent and was dominated by the exotic species *Megathyrsus maximus** (Guinea Grass). Other ground cover species included *Lomandra longifolia* (Spiny-headed Mat Rush), *Sida cordifolia**. The weed of national significance *Parthenium hysterophorus** (Parthenium Weed) was also recorded in this RE.



Plate 4 **RE 11.3.4 *Eucalyptus tereticornis* and/or *Eucalyptus spp*. Woodland on alluvial plains associated with Phillips Creek**

RE 11.4.4 *Dichanthium spp., Astrebla spp*. Grassland on Cainozoic clay plains

Two small patches of natural grassland (RE 11.4.4) occur south of Phillips Creek. The grassland is dominated by *Dichanthium setosum* (Bluegrass), *D. sericeum* (Queensland Bluegrass), *Iseilema membranaceum* (Small Flinders Grass) and *Astrebla pectinata* (Barley Mitchell Grass). Other grasses present include *Bothriochloa bladhii* (Forest Blue Grass), *Cenchrus ciliaris** (Buffel Grass), *Cyperus bifax, Cyperus difformis* (Dirty Dora), *Eriochloa crebra* (Spring Grass) and *Sporobolus caroli* (Fairy Grass). Herbs present include *Ammannia multiflora* (Jerry-jerry), *Alternanthera nana* (Hairy Joyweed), *Crotalaria sp., Eryngium paludosum* (Long Eryngium), *Haloragis stricta, Hibiscus gossypii var. vesicarius, Ipomoea plebeia, I. lonchophylla, Marsilea hirsuta* (Nardoo), *Mimulus gracilis* (Slender Monkey-flower), *Neptunia gracilis* (Native Sensitive Plant), *Rostellularia obtusa, Sesbania cannabina* (Sesbania Pea), *Sida fibulifera* (Pin Sida) and *Vigna vexillata* (Wild Cow Pea). The shrub, *Terminalia oblongata* (Yellowwood) is occasionally present.



Plate 5 RE 11.4.4 *Dichanthium spp., Astrebla spp*. Grassland on Cainozoic clay plains

RE 11.4.8 *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains

The canopy is dominated by *Eucalyptus cambageana* (Dawson Gum) (between 13 m and 15 m in height), with *Acacia harpophylla* (Brigalow) and *Lysiphyllum carronii* (Queensland Ebony) in the lower tree layers (between 8 m and12 m in height). The shrub layer comprises *Atalaya hemiglauca* (Whitewood), *Psydrax odorata* (Shiny-leaved Canthium), *Alectryon diversifolius* (Scrub Boonaree), *Lysiphyllum carronii* (Queensland Ebony), *Carissa ovata* (Currant Bush), *Diospyros humilis* (Small-leaved Ebony), *Eremophila mitchellii* (False Sandalwood), *Citrus glauca* (Desert Lime) and *Erythroxylum australe*. The ground layer is disturbed by grazing and is dominated by *Cenchrus ciliaris** (*B*uffel Grass), *Eriochloa crebra* (Spring Grass), *Paspalidium caespitosum* (Brigalow Grass), *Parthenium hysterophorus** (Parthenium Weed) and *Bothriochloa bladhii* (Forest Blue Grass).

RE 11.4.9 *Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains

Scattered patches of RE 11.4.9 occur across the Project Site. This RE comprises *Acacia harpophylla* (Brigalow) and *Casuarina cristata* (Belah) in the canopy with a range of species in the T2 including *Alectryon oleifolius* (Boonaree), *Flindersia dissosperma, Geijera parviflora* (Wilga) and *Owenia acidula* (Emu Apple). The shrub layer is dominated by *Denhamia oleaster, Carissa ovata* (Currant Bush) and *Grewia latifolia* (Dysentery Bush). The ground layer is disturbed by grazing and feral animals and comprises *Cenchrus ciliaris** (Buffel Grass), *Paspalidium caespitosum* (Brigalow Grass), *Dichanthium sericeum* (Queensland Bluegrass) and *Bothriochloa bladhii* (Forest Blue Grass).

In some patches *Casuarina cristata* (Belah) dominates and *Acacia harpophylla* (Brigalow) is absent. On Meadowbrook, it occurs as a small patch dominated by *Casuarina cristata* (Belah) with scattered *Eucalyptus populnea* (Poplar Box) (between 10 m and 14 m in height). The community is highly

disturbed by grazing with no shrub layer and limited ground cover comprising *Megathyrsus maximus** (Guinea Grass) and *Paspalidium* spp.

In the south of the Project Site *Casuarina cristata* (Belah) forms a low canopy with scattered *Corymbia dallachiana* (Ghost Gum) and *Terminalia oblongata* (Yellowwood) (between 6 m and 10 m in height).



Plate 6 **RE 11.4.9 *Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains**

RE 11.4.13 *Eucalyptus orgadophila* open woodland on Cainozoic clay plains.

RE 11.4.13 occurs scattered across the Project Site, south of Lake Vermont Mine Road and railway. *Eucalyptus orgadophila* (Mountain Coolibah) forms a sparse canopy (between 10 m and 14 m in height) with *Terminalia oblongata* (Yellowwood) and *Ventilago viminalis* (Supplejack) scattered in the lower tree layers (between 6 m and 8 m in height). There is a moderately dense ground layer of grasses, dominated by *Heteropogon contortus* (Black Speargrass) and *Dichanthium sericeum* (Queensland Bluegrass) with some *Paspalum dilatatum** (Paspalum).

RE 11.5.3 *Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces

RE 11.5.3 occurs commonly across the Project Site on sandy plains. Some variation in structure and species composition exists within this RE. At AECOM flora survey site south of the oxbow wetland, *Eucalyptus populnea* (Poplar Box) and *E. melanophloia* (Silver-leaved Ironbark) forms an open canopy (between 10 m and 14 m in height). The community is heavily disturbed by grazing and past clearing, rendering the shrub layer almost completely absent with the exception of the occasional immature *Acacia salicina* (Sally Wattle) and *Eucalyptus populnea* (Poplar Box).

A moderately dense ground layer of *Cenchrus ciliaris** (Buffel Grass) with occasional *Themeda triandra* (Kangaroo Grass) was also observed.

At AECOM flora survey site near Hughes Creek, *Eucalyptus populnea* (Poplar Box*)* forms an open canopy (between 10 m and 14 m in height) with a very sparse shrub layer of *Cassia brewsteri* (Yellowwood) and dense ground layer of *Cenchrus ciliaris** (Buffel Grass). The community is disturbed by grazing, previous thinning and feral animals.

At AECOM flora survey site south of Phillips Creek, *Eucalyptus populnea* (Poplar Box) forms an open canopy (between 13 m and 15 m in height) with occasional *Corymbia dallachiana* (Ghost Gum) and *Corymbia erythrophloia* (Variable-barked Bloodwood). *Acacia salicina* (Sally Wattle) is scattered in the lower tree layer (between 5 m and 7 m in height) with rare or incidental records of *Acacia excelsa* (Ironwood), *Hakea lorea* (Bootlace Oak), and *Grevillea striata* (Beefwood) also present. The community is disturbed by grazing and previous clearing, with a very sparse shrub layer of *Grewia latifolia* (Dysentery Bush) and *Carissa ovata* (Currant Bush) dense ground layer dominated by *Cenchrus ciliaris** (Buffel Grass) with occasional *Heteropogon contortus* (Black Speargrass) and *Aristida calycina*.



Plate 7 RE 11.5.3 *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* on Cainozoic sand plain

4.2.3 Conservation significant vegetation communities

4.2.3.1 EPBC Act threatened ecological communities

Field surveys confirmed the presence of two EPBC Act TECs that are both endangered status, namely:

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

A total of 1.73 ha of *Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* and 396.54 ha of *Brigalow (Acacia harpophylla dominant and co-dominant)* TECs have been ground-truthed and delineated within the Project Site. Table 16 outlines the EPBC Act TECs and analogous REs.

The *Weeping Myall Woodlands* TEC is characterised as open woodlands to woodlands in which *Acacia pendula* (Weeping Myall) is the sole or dominant overstorey species (TSSC, 2009b). REs identified as potentially containing *Weeping Myall Woodlands* (i.e. RE 11.3.2), were dominated by *Eucalyptus populnea* (Poplar Box), excluding the communities from the TEC. Similarly, no vegetation communities consistent with the Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions TEC were present within the Project Site.

Table 16 EPBC Act Listed Threatened Ecological Communities and Related Regional Ecosystems

EPBC Act TEC	Analogous REs	EPBC Act Status	Project Site (ha)	Project Footprint (ha)
Brigalow (Acacia harpophylla dominant and co-dominant)	RE 11.3.1 RE 11.4.8 RE 11.4.9 (only polygons which met the criteria for this TEC)	Endangered	396.54	210.31
Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	RE 11.4.4	Endangered	1.73	0.075

Natural grasslands TEC

The *Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC is listed as Endangered under the EPBC Act.

This TEC is characterised by the presence of native tussock perennial grasses with the shrub layer a minor component and the absence of a tree canopy. The species composition of tussock grasslands varies throughout their range and is influenced by factors such as rainfall, soil, geology and land use history (Threatened Species Scientific Committee, 2009). This TEC is mostly dominated by *Dichanthium* spp. (Bluegrasses), with tropical *Aristida* spp. (three-awned grasses) and *Panicum* spp. (panic grasses). This ecological community usually occurs on flat ground or gently undulating rises, with soils being cracking or self-mulching and this development of deep cracks may tear tap roots leading to a possible reason for the absence of trees and woody shrubs (Threatened Species Scientific Committee, 2009). Water penetration deep into the soil profile is inhibited by the high water holding capacity of the clay soils which may provide another reason as to the dominance of ground layer species.

In Queensland, the *Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC can be defined using the RE framework, where a number of REs are considered analogous with the TEC, provided that other key diagnostic criteria and condition thresholds are met. In addition, the definition of the ecological community extends to all natural grasslands within specified subregions that meet the key diagnostic characteristics and condition thresholds (Threatened Species Scientific Committee, 2009). The *Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC is analogous to areas mapped as REs 11.3.21, 11.4.4, 11.4.11, 11.8.11, 11.9.9, 11.9.12 and 11.11.17.

Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin have been identified as occurring on the Project Site as two small patches of the analogous RE, RE 11.4.4 on clay depressions which occurs south of Phillips Creek (Figure 10).The community is dominated by *Dichanthium sericeum* (Queensland Bluegrass), *D. setosum* (Bluegrass), *Iseilema membranaceum* (Small Flinders Grass), *Astrebla pectinata* (Barley Mitchell Grass), *Cyperus bifax, and Eriochloa crebra* (Spring Grass) with little invasion by *Cenchrus ciliaris** (Buffel Grass) and *Bothriochloa pertusa** (Indian Bluegrass) and meets the criteria for the *Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC.

Brigalow TEC

The *Brigalow* (*Acacia harpophylla dominant and co-dominant*) TEC is listed as Endangered under the EPBC Act.

This TEC is characterised by *Acacia harpophylla* (Brigalow) as one of the dominant species in the tree layer. The species may also be co-dominant (in some circumstances with other Myrtaceous species, most commonly *Casuarina cristata* (Belah)). The community ranges in composition and structure however is typically represented by a combination of a number of species which are associated with acidic and salty clay soils (Threatened Species Scientific Committee 2013). In Queensland, the *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC is defined using the RE framework, where a number of REs are considered analogous with the TEC, provided that other key diagnostic criteria and condition thresholds are met.

Brigalow (Acacia harpophylla dominant and co-dominant) TECs have been identified as occurring across the Project Site in RE 11.3.1, RE 11.4.8 and RE 11.4.9 (Figure 10). To meet the key diagnostic characteristics of the TEC a patch must include the presence of *Acacia harpophylla* (Brigalow) as one of the most abundant tree species and it must be either dominant or co-dominant in the canopy layer (DoE, 2013). Several patches of RE 11.4.9 within the Project Site did not meet this threshold and were dominated by *Casuarina cristata* (Belah) with *Acacia harpophylla* (Brigalow) absent. As such these patches were excluded from mapping and area calculations for this TEC.

4.2.3.2 Endangered Regional Ecosystems

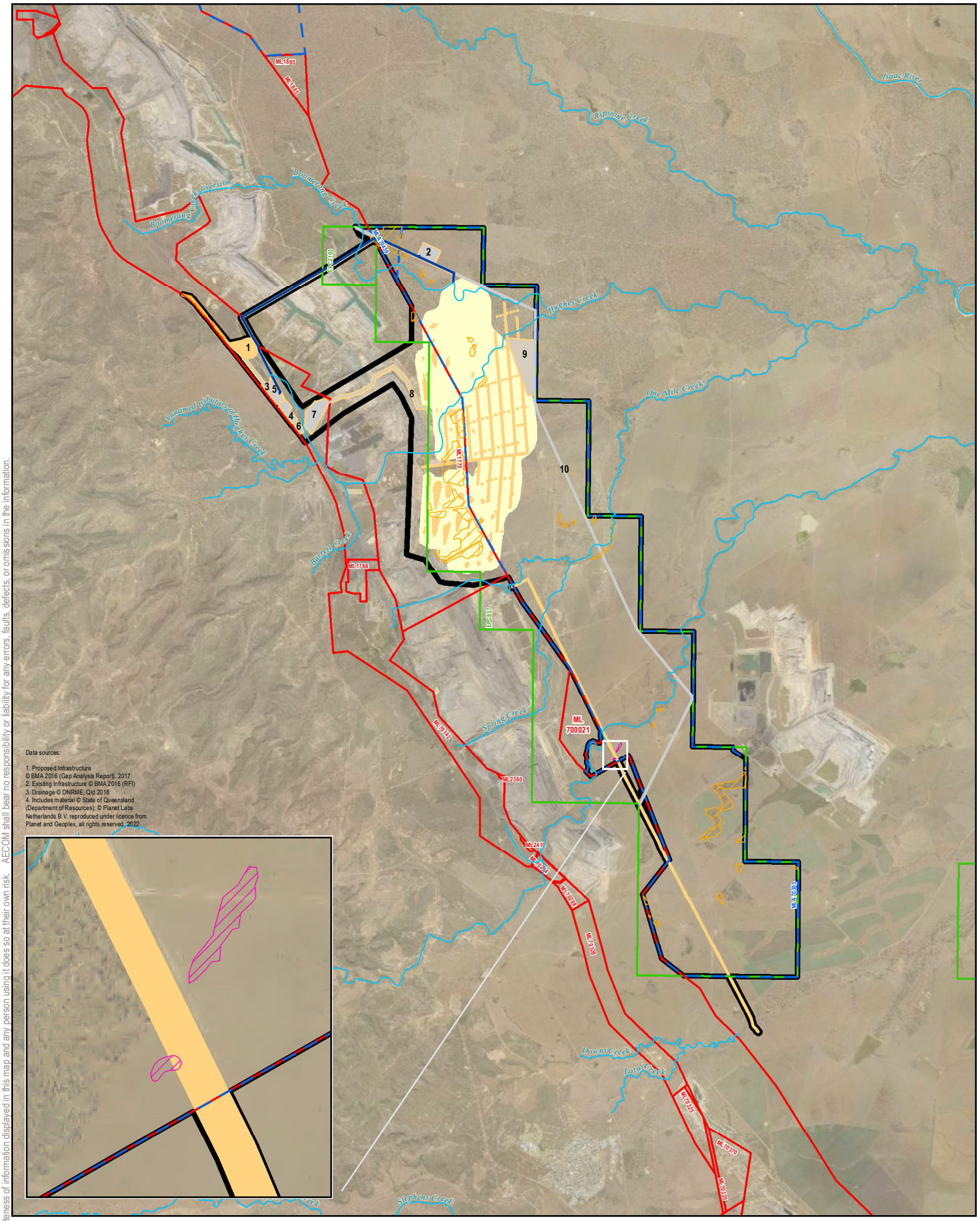
Three REs are identified as endangered as per the Biodiversity Status. A total of 526.68 ha of EREs have been observed and mapped within the Project Site (Figure 9). All RE descriptions and status can be seen in Section 4.1.2. HVR (VM Act Status only) of three EREs are mapped by DoR within the Project Site. Extent of EREs and HVR EREs within the Project Site is quantified in Table 17 and Table 18 respectively.

Table 17 Endangered Regional Ecosystems

Regional Ecosystem	Biodiversity Status	VM Act Status	Project Site (ha)	Project Footprint (ha)
RE 11.3.1	Endangered	Endangered	15.76	6.58
RE 11.4.8	Endangered	Endangered	322.35	222.45
RE 11.4.9	Endangered	Endangered	188.57	32.56
Total			**526.68**	**261.59**

Table 18 High Value Regrowth Endangered Regional Ecosystems

High Value Regrowth Regional Ecosystem	Biodiversity Status	VM Act Status	Project Site Extent (ha)	Project Footprint Extent (ha)
HVR RE 11.3.1	NA	Endangered	0.30	0.10
HVR RE 11.4.8	NA	Endangered	37.94	1.21
HVR RE 11.4.9	NA	Endangered	50.67	2.68
Total			**88.91**	**3.99**



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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Pipeline
- Watercourse

Threatened ecological community

- Brigalow (Acacia harpophylla dominant and co-dominant)

Threatened Ecological Community

- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin

Surface Infrastructure

1 Rail Loading Balloon Loop
2 Process Water Dam
3 Product Stockpiles
4 CHPP
5 Raw Water Dam
6 ROM Pad
7 Future MIA
8 Conveyor
9 Construction Village
10 Transport and Infrastructure Corridor

N

Figure 10
Threatened ecological communities observed within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:158,094 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

BMA
BHP Mitsubishi Alliance

DATE: 31/05/2024 VERSION: 8

Filename: L:\Secure\Projects\605X\60507031\4. Tech Work Area\4.98 GIS 2021\02_MXDs\01 Environmental Impact Statement\C-1 Ecology\60507031_G099_v8_A4P.mxd

4.2.4 Conservation significance flora species

The literature review and desktop searches identified seven flora species of conservation significance as potentially occurring in the survey area (Section 4.1.5). Of those seven species, field surveys undertaken by SKM confirmed the presence of one: *Dichanthium setosum* (Bluegrass), which is listed as vulnerable under the EPBC Act.

No threatened flora species within the Project Site were identified during the AECOM field surveys. However, suitable habitat within the Project Site was confirmed for the known occurrence of *Dichanthium setosum* (Bluegrass). The likely occurrence of *Dichanthium queenslandicum* (King Bluegrass) was also confirmed as this species is known to inhabit similar areas to *Dichanthium setosum* (Bluegrass). These two species are discussed further below.

Dichanthium setosum (Bluegrass)

Dichanthium setosum (Bluegrass) is an upright perennial grass to a metre in height. *Dichanthium setosum* occurs from Toowoomba in the south to the Lynd Junction in the north, with isolated collections from the Palmer River on the Cape and Lawn Hill NP near the Northern Territory border (WetlandInfo, 2019b). It has been recorded in Brigalow Belt, Cape York Peninsula, Desert Uplands, Einasleigh Uplands, North West Highlands and South East Queensland Bioregions. *Dichanthium setosum* occurs in heavy soils (predominantly cracking clays or alluvium, often in gilgai) in woodland or open woodland usually dominated by Acacia (brigalow) and/or Eucalyptus species. The climate is tropical to subtropical and markedly seasonal with the habitat drying out for part of the year (WetlandInfo, 2019b).

Dichanthium setosum was recorded in the south of the Project Site where it was observed within RE 11.4.4 (*Dichanthium* spp., *Astrebla* spp. Grassland on Cainozoic clay plains) which forms part of the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin TEC.

The extent of potential habitat is presented in Table 19 and Figure 7. A total of 0.075 ha of potential habitat occurs within the Project Footprint; however this area occurs within and adjacent to the path of a proposed overhead power transmission line and is unlikely to be directly impacted by the Project construction activities.

Table 19 Potential habitat for *Dichanthium setosum*

Habitat definition	Total area within Project Site (ha)	Area (ha) within Project Footprint
Naturally derived grasslands or open woodlands on heavy basaltic black soils or stony red-brown hard-setting loam with clay subsoil (Department of Agriculture Water and the Environment, 2020b).	1.73	0.075

Dichanthium queenslandicum (King Bluegrass)

Dichanthium queenslandicum (King Bluegrass) is an upright perennial grass to 80 cm in height. This species is endemic to Queensland with the main population centred around Emerald (Central Queensland). This species occurs in three disjunct populations: Hughenden district, Nebo to Monto and west to Clermont and Rolleston, and Dalby district, Darling Downs (Threatened Species Scientific Committee, 2013). *Dichanthium queenslandicum* occurs on black cracking clay soils in tussock grasslands commonly in association with *Dichanthium* spp. and *Bothriochloa* spp. Or other native grass species found on this soil type (Wetland Info, 2019a). This species is predominantly found in natural bluegrass grassland of central and southern Queensland including the EPBC Act listed the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin TEC.

This species was not recorded within the Project Site, however The Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin TEC is likely to provide suitable habitat for *Dichanthium queenslandicum*.

The extent of potential habitat is presented in Table 20 and Figure 8. A total of 0.075 ha of potential habitat occurs within the Project Footprint however this area occurs within and adjacent to the path of a

proposed overhead power transmission line and is unlikely to be directly impacted by the project construction activities.

Table 20 Potential habitat for *Dichanthium queenslandicum*

Habitat definition	Total area (ha) within Project Site (ha)	Area (ha) within Project Footprint (ha)
Naturally derived grasslands or open woodlands on heavy basaltic black soils (Department of Agriculture Water and the Environment, 2020b).	1.73	0.075

4.2.5 Flora diversity

The field surveys identified the presence of 315 taxa representing 70 families and 190 genera. Families represented by three or more genera included Acanthaceae (4), Amaranthaceae (3), Apocynaceae (6), Asteraceae (13), Boraginaceae (3), Cactaceae (3), Caesalpiniaceae (3), Chenopodiaceae (5), Convolvulaceae (4), Cyperaceae (3), Fabaceae (16), Mimosaceae (5), Myrtaceae (4) Phyllanthaceae (3), Poaceae (35), Rubiaceae (3), Rutaceae (3) and Sapindaceae (3).

Genera represented by three or more species included *Acacia* (14 species), *Alectryon* (3), *Aristida* (5), *Astrebla* (3), *Bothriochloa* (5), *Capparis* (5), *Casuarina* (3), *Chloris* (6), *Corymbia* (4), *Crotalaria* (3), *Cyperus* (10), *Digitaria* (4), *Eragrostis* (3), *Eremophila* (5), *Eucalyptus* (11), *Indigofera* (3), *Melaleuca* (3), *Panicum* (5), *Paspalidium* (4), *Psydrax* (3), *Sida* (6) and *Sporobolus* (4).

The surveys identified 40 exotic taxa representing 70 families. Families with three or more exotic weed taxa include Asteraceae (4), Cactaceae (4) and Poaceae (12). Weed species present are discussed further below.

A full flora species list including exotic species identified from each survey period is provided in Appendix B.

4.2.6 Weeds

A total of 40 exotic species were recorded from the Project Site during the field surveys, including 11 species which are considered to be a 'Restricted Matter' under the Queensland *Biosecurity Act 2014.* Eight of these species are WoNS. A list of these significant weed species is provided in Table 21.

The Isaac Region Biosecurity Plan 2020 -2023 (Draft), identifies key priority weed species, including restricted matter identified under the Queensland *Biosecurity Act 2014*, that are having, or with potential to have, adverse environmental, economic, or social impact in the Isaac region (Isaac Regional Council, 2019). Fifteen species recorded during the field surveys were identified within the Isaac Region Biosecurity Plan 2020-2023. These species are outlined in Table 21**.**

One other Biosecurity Act-listed flora species, namely *Sporobolus natalensis* (Giant Rat's Tail Grass), was also identified in the desktop assessment and has potential to be introduced to the Project Site. No areas containing *Sporobolus natalensis* (Giant Rat's Tail Grass) were identified during field surveys within the Project Site.

Table 21 Weed species recorded in the Project Site

Species	Common Name	Biosecurity Matter[1]	WoNS	Isaac Region Biosecurity Plan – Priority Weeds	Source[2]
*Argemone ochroleuca**	Mexican Poppy	-	-	Yes	AECOM
*Bryophyllum daigremontianum x delagoense**	Mother of Millions Hybrid	Restricted Matter	-	Yes	ES
*Cryptostegia grandiflora**	Rubber Vine	Restricted Matter	Yes	Yes	ES
*Harrisia martinii**	Harrisia Cactus	Restricted Matter	-	Yes	AECOM, ES
*Hymenachne amplexicaulis**	Hymenachne	Restricted Matter	Yes	Yes	ES
*Jatropha gossypiifolia**	Bellyache Bush	Restricted Matter	Yes	Yes	ES
*Lantana camara**	Lantana	Restricted Matter	Yes	Yes	AECOM, SKM, ES, WL
*Lantana montevidensis**	Creeping Lantana	Restricted Matter	-	-	ES
*Leucaena leucocephala**	Leucaena	-	-	Yes	AECOM
*Opuntia tomentosa**	Velvety Prickly Pear	Restricted Matter	Yes	Yes	SKM, ES, WL
*Opuntia stricta**	Prickly Pear	Restricted Matter	Yes	Yes	SKM, ES, WL
*Parthenium hysterophorus**	Parthenium Weed	Restricted Matter	Yes	Yes	AECOM, SKM, ES, WL
*Stachytarpheta jamaicensis**	Snakeweed	-	-	Yes	AECOM
*Themeda quadrivalvis**	Grader Grass	-	-	Yes	AECOM
*Vachellia nilotica**	Prickly Acacia	Restricted Matter	Yes	Yes	AECOM
Vachellia farnesiana	Mimosa Bush	-	-	Yes	AECOM

[1] A biosecurity matter refer to matters which are listed under the *Biosecurity Act 2014.* A 'Prohibited' matters is a biosecurity matter that is not currently present in Queensland, but would have a significant adverse impact on social, economic, health or environment if it entered the state. A 'Restricted matter' refers to a biosecurity matter found in Queensland which has a significant impact on social, economic, health or environment.

[2] Source: AECOM (Field Surveys), SKM (Field Surveys), ES (EcoServe 2005), WL (Wildlife Online).

5.0 Terrestrial fauna results

5.1 Literature review results

5.1.1 Essential Habitat mapping

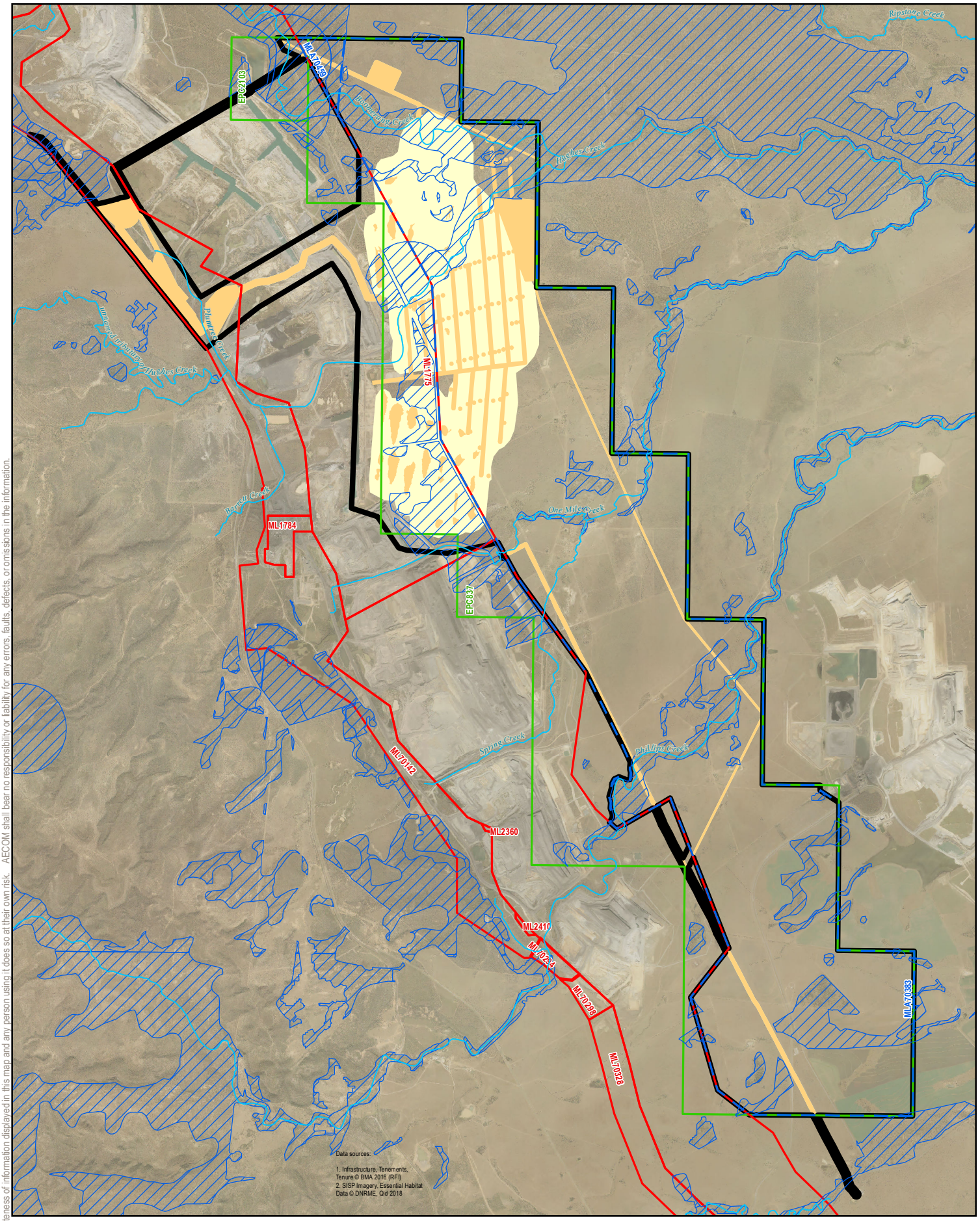
The Essential Habitat mapping shows vegetation which is known to support Essential Habitat values for particular conservation significant species, or habitat which surrounds point records of conservation significant species.

State mapping includes a total of 1,989.44 ha of Essential Habitat for two conservation significant fauna species within the Project Site (Figure 11). Essential Habitat for Squatter Pigeon (*Geophaps scripta scripta*) and Ornamental Snake (*Denisonia maculata*) is mapped based on species habitat models and suitable habitat surrounding previous records of this species. Approximately 722.95 ha of essential Habitat is located within the Project Footprint (Figure 11).

5.1.2 Biodiversity values

An analysis of the BPA for the Brigalow Belt shows that 617.90 ha of State significant habitat, 861.21 ha of regionally significant habitat and 41.08 ha of locally significant habitat is present within the Project Footprint.

Areas of conservation significance identified within a 100 km radius of the survey area are depicted in Figure 12. Regional connectivity and biodiversity corridors identified from the BPA within the Project Site are displayed in Figure 12. The Brigalow Belt BPA mapping indicates that the major creek systems within the Project Site (Phillips Creek, Plumtree Creek, Boomerang Creek, Hughes Creek and One Mile Creek) and their associated riparian vegetation contribute to habitat connectivity from west to east on a State level. The north-east of the Project Site is largely mapped as significant for biodiversity at a State level and several disjunct patches of regional significance for biodiversity are mapped throughout the southern half of the Project Site, generally associated with watercourses.



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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Vegetation Management Act Essential Habitat
- Watercourse

N

Figure 11
Essential Habitat

Environmental Impact Statement
Saraji East Mining Lease Project

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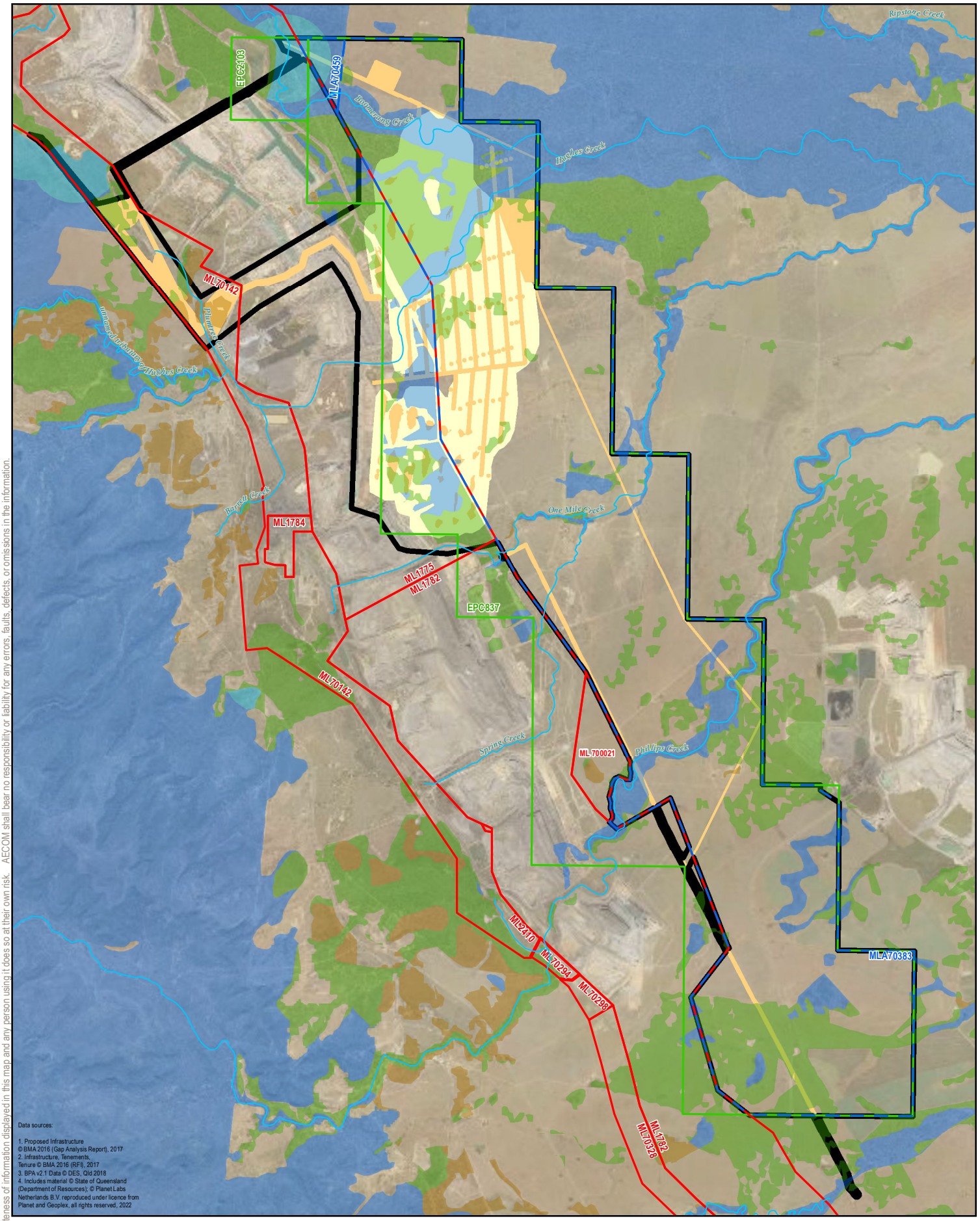
Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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BHP Mitsubishi Alliance

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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Biodiversity significance

- State Mapped Habitat for Endangered, Vulnerable and Near Threatened taxa
- State Values
- Regional Values
- Local or Other Values

N

Figure 12
Biodiversity planning assessment mapping within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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DATE: 31/05/2024 VERSION: 5

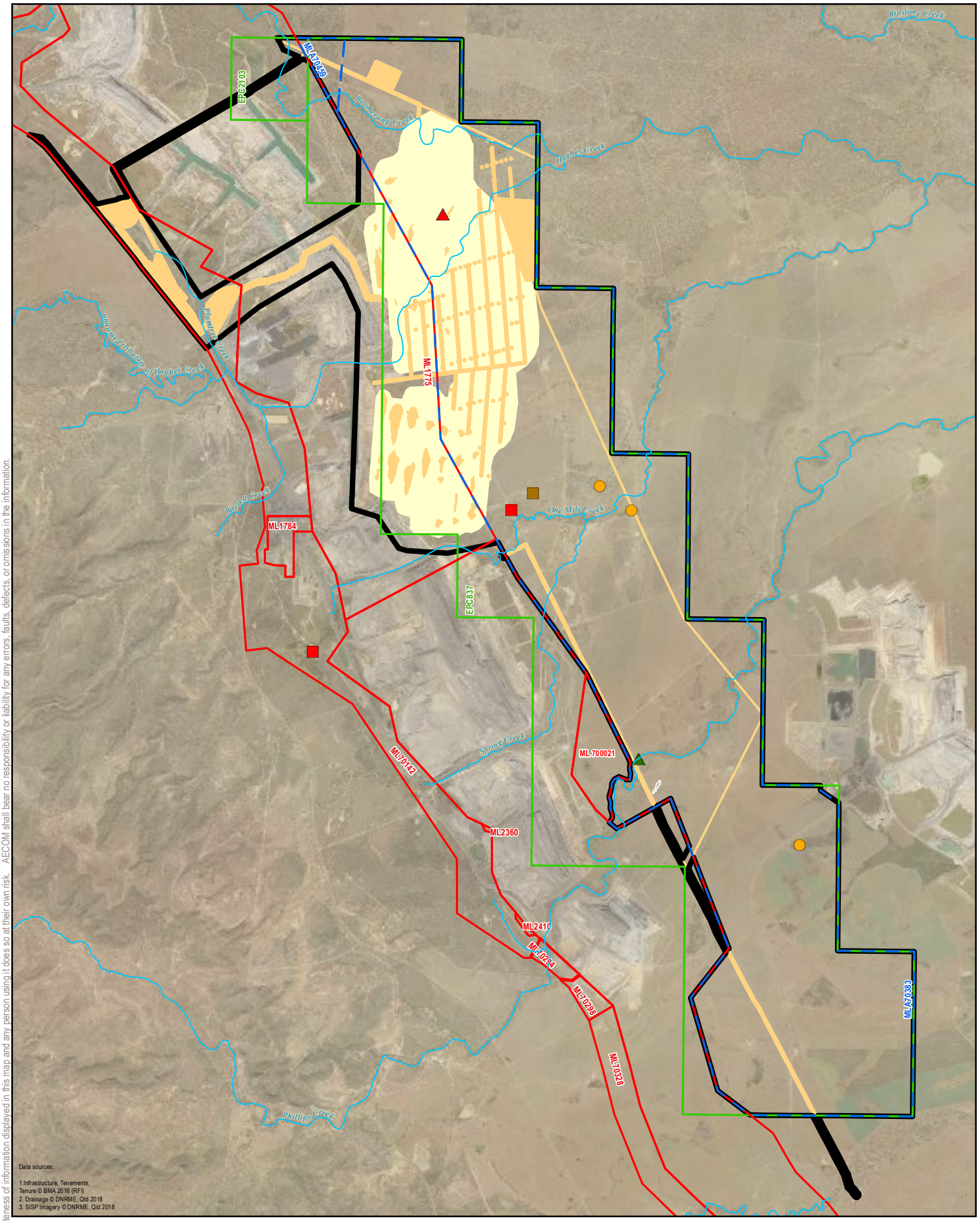
5.1.3 Fauna of Conservation Significance

5.1.3.1 Listed Threatened Species

Twenty-one conservation significant fauna species listed under the EPBC Act and/or NC Act were identified in the database search results for the Project Site. An initial likelihood of occurrence assessment was conducted to determine which of these species are known, likely, potential, unlikely or no potential to occur within the Project Site. This assessment was based on an understanding of the preferred habitats of the species, knowledge of the type and condition of habitats present, and the results of the previous Saraji Mine fauna surveys (e.g. SKM). These evaluations are presented in Table 22.

Of those 21 species, 7 threatened species have been confirmed in previous field surveys. Australian Painted Snipe was observed by SKM in the Project Site in 2007. During the 2010 SKM surveys, Ornamental Snake (*Denisonia maculata*), Greater Glider (*Petauroides volans*) and Squatter Pigeon (*Geophaps scripta scripta*) were also recorded within the Project Site (Figure 13). Grey Falcon (*Falco hypoleucos*) has also been previously recorded at the Saraji Mine by EcoServe in 2005. An additional Special Least Concern species, Short-beaked Echidna (*Tachyglossus aculeatus*) was recorded within the Project Site by SKM in 2007.

The full list of database search results is provided in Appendix A.



Data sources:

1.Infrastructure, Tenements, Tenure © BMA 2016 (RF)
2. Drainage © DNRME, Qld 2018
3. SISP Imagery © DNRME, Qld 2018

LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Threatened fauna and flora

- Ornamental Snake (SKM 2012)
- Ornamental snake (AECOM 2020)
- Koala (AECOM 2020)
- Greater glider (AECOM 2020)
- Squatter pigeon (AECOM 2017)
- Squatter Pigeon (SKM 2012)
- Painted Snipe (SKM 2012)

Figure 13

Observed threatened flora and fauna within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

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0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Table 22 Conservation Significant Fauna Species Potentially Occurring in the Project Site

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
Reptiles					
Denisonia maculata	Ornamental Snake	V	V	This species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai mounds and depressions in Queensland RE Land Zone 4, but also lake margins and wetlands. This species' habitat is likely to be found in *Acacia harpophylla*, *A. cambagei*, *A. argyrodendron* or *Eucalyptus coolabah*-dominated vegetation communities, or pure grassland associated with gilgai. These are commonly mapped as Queensland REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9, 11.5.16 or mapped as cleared but where the above REs formerly occurred (Department of Sustainability Environment Water Population and Communities, 2011). This species is known only from the Brigalow Belt North and parts of the Brigalow Belt South biogeographical regions. The core of the species' distribution occurs within the drainage system of the Fitzroy and Dawson Rivers (Department of Agriculture Water and the Environment, 2020b).	**Known.** The Ornamental Snake (*Denisonia maculata*) has been recorded in the Project Site on multiple occasions: • Two locations during surveys by AECOM (2020) • Three locations during surveys by SKM (2012) Essential Habitat for the species is also mapped in the Project Site that relates to modelled habitat and previous records associated with studies conducted for the existing Saraji Mine.
Egernia rugosa	Yakka Skink	V	V	Habitat requirements are poorly known; however, this species is known from rocky outcrops, sand plain areas and dense ground vegetation, in association with open dry sclerophyll forest (ironbark) or woodland, brigalow forest and open shrubland. In the Brigalow Belt bioregion, core habitat includes: *Eucalyptus populnea* (Poplar Box) woodland, *Acacia aneura* (*M*ulga) woodland, *Callitris glaucophylla* (*W*hite Cypress Pine); usually in association with eucalypt species such as *E. populnea*, *E. melanophloia* or *Corymbia tessellaris*, ironbark (typically *E. melanophloia*) woodland, and disturbed, treated and cleared areas of suitable habitat, grazed or ungrazed, where suitable microhabitat features still remain (Ferguson & Mathieson, 2014). Colonies have been found in large hollow logs, cavities or	**Potential.** Suitable habitat (*Eucalyptus populnea* (Poplar Box) Woodland (RE 11.5.3 and RE11.3.2) for the Yakka Skink (*Egernia rugosa*) is found within the Project Site. No nearby records occur. Most records are found south of the Project Site with the nearest recent recorded occurrence at the Jellinbah Mine (ALA), 100 km south of the Project Site in 2000.

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, tunnels and sinkholes (Department of Sustainability Environment Water Population and Communities, 2011). The known distribution of the Yakka Skink (*Egernia rugosa*) extends from the coast to the hinterland of sub-humid to semi-arid eastern Queensland. This vast area covers portions of the Brigalow Belt, Mulga Lands, South-east Queensland, Einasleigh Uplands, Wet Tropics and Cape York Peninsula Biogeographical Regions (Department of Agriculture Water and the Environment, 2020b).	
Elseya albagula	Southern Snapping Turtle	CE	E	The Southern Snapping Turtle (*Elseya albagula*) prefers clear, flowing, well-oxygenated water associated with their ability to extract oxygen from the water via cloacal respiration. Populations occur at much lower densities where flow is reduced (upstream of dams, weirs etc.). This species occurs only in three catchments (Burnett, Mary and Fitzroy) and is considered a habitat specialist (Department of Agriculture Water and the Environment, 2020b).	**Unlikely.** Streams in the Project Site are ephemeral and are subject to variable flow regimes, with the availability of permanent water largely accounted for by on-stream farm dams. The condition of the streams within the Project Site are considered to be poor to moderate with low habitat and channel diversity. No nearby records occur.
Furina dunmalli	Dunmall's Snake	V	V	This species has been found in a broad range of habitats, including: forests and woodlands on black alluvial cracking clay and clay loams dominated by *Acacia harpophylla*, *A. burrowii, A. deanei, A. leiocalyx*, *Callitris* spp. Or *Allocasuarina luehmannii*; and various *Corymbia citriodora*, *Eucalyptus crebra* and *E. melanophloia*, *Callitris glaucophylla* and *Allocasuarina luehmannii* open forest and woodland associations on sandstone derived soils. The Dunmall's Snake (*Furina dunmalli*) occurs primarily in the Brigalow Belt region in the south-eastern interior of Queensland.	**Potential.** Suitable habitat in the form of brigalow woodland on clay (RE 11.3.1 /11.4.8/ 11.4.9) is present across the Project Site. The nearest recent recorded occurrence was in 1999 located near Clermont, 80 km to the west.

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				Records indicate sites at elevations between 200–500 m above sea level (Department of Agriculture Water and the Environment, 2020b).	
Lerista allanae	Allan's Lerista, Retro Slider	E	E	Suitable habitat for this species is described as vegetation occurring on mid to dark-brown-coloured, non-cracking clay soils in Queensland REs 11.8.5 and 11.8.11/11.8.5 and grassy open-woodland mapped as cleared but where the above REs formerly occurred (Department of Sustainability Environment Water Population and Communities, 2011). The Retro Slider's (*Lerista* allanae) range is believed to occur within the area bound by coordinates: 21°00'–24°00' S and 147°00'–149°00' E. This area is within the Brigalow Belt North Bioregion (Department of Agriculture Water and the Environment, 2020b).	**Unlikely.** This species is known only from black soil downs in the central Brigalow Belt Region from three localities: Clermont, 55 km north-east of Clermont and 30 km northwest of Capella.
Rheodytes leukops	Fitzroy River Turtle	V	V	Fitzroy River Turtles (*Rheodytes leukops*) are generally attributed to fast-flowing clear freshwater rivers and rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles, commonly in association with *Eucalyptus tereticornis, Casuarina cunninghamiana, Callistemon viminalis, Melaleuca linariifolia* and *Vallisneria* sp. The bulk of the records for this species are associated with the large primary streams of the Fitzroy River system: the Nogoa, Comet, MacKenzie, Connors, Isaac, Dawson and Fitzroy Rivers (Department of Agriculture Water and the Environment, 2020b).	**Unlikely.** No suitable habitat for this species has been previously found within the Project Site and no nearby database records are available.
Birds					
Calidris ferruginea	Curlew Sandpiper	CE, M	SLC	Curlew Sandpipers (*Calidris ferruginea*) mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and	**Potential.** Wetlands in the north of the Project Site may provide limited suitable habitat. No records are available from previous surveys and no records from Wildlife Online or ALA databases are

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				lagoons near the coast, and ponds in saltworks and sewage farms. They occur in both fresh and brackish waters. In Australia, Curlew Sandpipers (*Calidris ferruginea*) occur around the coasts and are also quite widespread inland, though in smaller numbers (Department of Agriculture Water and the Environment, 2020b).	available within 10 km. The nearest recorded inland occurrences are at Lake Maraboon, 125 km south of the Project Site.
Erythrotriorchis radiatus	Red Goshawk	V	E	The Red Goshawk (*Erythrotriorchis* radiatus) occurs mostly in extensive areas of coastal and subcoastal open forest and woodland that support a mosaic of vegetation types. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins. Permanent water (watercourses and wetlands) is usually present in close proximity, with tall emergent trees used for nesting. The Red Goshawk (*Erythrotriorchis radiatus*) is thought to have a very large home range covering between 50 and 220 square kilometres. Sparsely distributed across coastal and sub-coastal Australia, from the western Kimberly to northern New South Wales. Appears to have been a contraction in range in recent years. Occasionally recorded from gorge country in central Australia and western Queensland (Department of Agriculture Water and the Environment, 2020b).	**Unlikely.** Suitable habitat is not present in the Project Site. No nearby records occur.
Geophaps scripta scripta	Squatter Pigeon (Southern Subspecies)	V	V	The Squatter Pigeon (*Geophaps scripta scripta*) occurs in dry grassy woodland and open forest, mostly in sandy areas close to water. Breeding and foraging habitat is centralised around water resources such as dams and creeks. This sub-species is ground-dwelling that inhabits the grassy understorey of open eucalypt woodland, as well as sown grasslands with scattered remnant trees, disturbed areas (such as roads, railways, settlements and stockyards), scrubland, and *Acacia* regrowth.	**Known.** The Squatter Pigeon (Southern) (*Geophaps scripta scripta*) was recorded in the Project Site by SKM (2012) and AECOM (2017). Essential Habitat for the species has been mapped in the Project Site in association with modelled habitat and previous records.

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				This sub-species is now largely (if not wholly) restricted to Queensland, from the New South Wales border, north to the Burdekin River, west to Charleville and Longreach, and east to the coast to Townsville and Proserpine (Department of Agriculture Water and the Environment, 2020b).	
Grantiella picta	Painted Honeyeater	V	V	The Painted Honeyeater (*Grantiella picta*) occurs in dry forests and woodlands, where its primary food is mistletoes in the genus *Amyema*, though it will also take some nectar and insects. It is also known to occur in riparian woodland communities dominated by eucalypt species such as *Eucalyptus camaldulensis*, although its breeding distribution is dictated by the presence of mistletoes which are largely restricted to older trees. The species is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory. The greatest concentrations and almost all records of breeding come from south of 26º S, on inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, Queensland (Department of Agriculture Water and the Environment, 2020b).	**Potential.** Broad habitat types for this species exist within riparian zones however mistletoes on which they depend for a feeding resource were rare. A recent record of the Painted Honeyeater (*Grantiella picta*) occurs in a property adjacent to Saraji Mine.
Neochmia ruficauda ruficauda	Star Finch (Eastern)	E	E	The Star Finch (Eastern) (*Neochmia ruficauda* ruficauda) occurs mainly in grasslands and grassy woodlands that are located close to bodies of fresh water. It also occurs in cleared or suburban areas such as along roadsides and in towns. Studies at nine former sites of the Star Finch (Eastern) (*Neochmia ruficauda* ruficauda) found that the habitat consisted mainly of woodland. These habitats are dominated by trees that are typically associated with permanent water or areas that are regularly inundated; the most common species are *Eucalyptus coolabah*, *Eucalyptus tereticornis*, *Eucalyptus tessellaris*, *Melaleuca leucadendra*, *Eucalyptus camaldulensis* and *Casuarina cunninghamii.*	**Unlikely.** Suitable habitat occurs within the Project Site however no confirmed sightings of this species have been made since 1995.

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				Based on the small number of accepted records, the distribution of this species formerly extended from Bowen in central Queensland, south to the Namoi River in northern New South Wales, and west to the Blackall Range. Recent records have been obtained only from scattered sites in central Queensland (i.e. between 21°S and 25°S, and 141°E and 150°E) and, consequently, the Star finch (eastern) (*Neochmia ruficauda* ruficauda) now appears to be extinct in both south-eastern Queensland and northern New South Wales (Department of Agriculture Water and the Environment, 2020b).	
Poephila cincta cincta	Southern Black-throated Finch	E	E	The Black-throated Finch's (Southern) (*Poephila cincta* cincta) preferred habitat is grassy open woodland/forest dominated by *Eucalyptus*, *Melaleuca* or *Acacia*, but they are also known from pandanus flats and scrubby plains. The Black-throated Finch (Southern) (*Poephila cincta* cincta) feeds on the seed of native grasses from the ground. Three resources are required for the species to persist: water, grass seeds and trees providing suitable habitat. If any of these three resources are not available, Black-throated Finch (Southern) (*Poephila cincta* cincta) is unlikely to be present. Since 1998, birds likely to be of the southern subspecies have been recorded at the following sites: Townsville and its surrounds; Ingham, and sites nearby; and scattered sites in central-eastern Queensland (Great Basalt Wall, Yarrowmere Station, Moonoomoo Station, Doongmabulla Station, Fortuna Station and Aramac) (Department of Agriculture Water and the Environment, 2020b).	**Unlikely.** Suitable habitat occurs within the Project Site; however, this species is now restricted to three key sites within Queensland. No nearby records occur.
Rostratula australis	Australian Painted Snipe	E	V	Preferred habitat includes shallow inland wetlands, brackish or freshwater, that are permanently or temporarily inundated. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia or canegrass or sometimes	**Known.** This species was observed from an area of flooded *Acacia harpophylla* (Brigalow)

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				Melaleuca (*T*ea-tree). Breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. This species has been recorded from wetlands in all Australian States, however is most common in eastern Australia, especially the Murray-Darling Basin. Individuals are nomadic, and there is some evidence of partial migration from south-eastern wetlands to coastal central and northern Queensland in autumn and winter (Department of Agriculture Water and the Environment, 2020b).	woodland within the Project Site during SKM surveys in 2007.
Falco hypoleucos	Grey Falcon	-	V	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. The species is mainly found where annual rainfall is less than 500 mm, except when wet years are followed by drought, when the species becomes more widespread. There is some evidence of regular movements, probably mostly of immatures, during the non-breeding season toward northern and coastal areas. The species appears to be absent from Cape York Peninsula, areas east of the Great Dividing Range in Queensland and New South Wales.	**Known**. Recorded on Saraji Mine by EcoServe, 2005. Potential habitat for foraging and breeding occurs within the Project Site.
Mammals					
Dasyurus hallucatus	Northern Quoll	E	-	The Northern Quoll (*Dasyurus hallucatus*) occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. Northern quolls are also known to occupy non rocky lowland habitats such as beachscrub communities in central Queensland. Northern Quoll (*Dasyurus hallucatus*) habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal.	**Unlikely.** Limited suitable habitat for this species has been previously identified in the Project Site in the form of open woodland with ground timber; however, these areas are isolated and are unlikely to support a population of Northern Quoll (*Dasyurus hallucatus*). The closest record is from 1969, located approximately 60 km south-east of the Project Site.

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				In Queensland, the Northern Quoll (*Dasyurus hallucatus*) is known to occur as far south as Gracemere and Mount Morgan, south of Rockhampton, as far north as Weipa in Queensland and extends as far west into central Queensland to the vicinity of Carnarvon Range National Park (Department of Agriculture Water and the Environment, 2020b).	
Macroderma gigas	Ghost Bat	V	V	The Ghost Bat (*Macroderma gigas*) currently occupies habitats ranging from the arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. Roost areas used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23°−28°C and a moderate to high relative humidity of 50−100 per cent. Most of the colony disperses (up to 150 km) from permanent roosts during the non-breeding season in the cooler months. During this time this species use large numbers of caves, rock shelters, overhangs, vertical cracks, and mines during the year as day roosts. This species is recorded from a wide range of habitats from rainforest, monsoon and vine scrub in the tropics to open woodlands and arid areas. In Queensland this species is currently distributed in only 4-5 highly disjunct populations along the coast and inland from the McIlwraith Range in Cape York to Rockhampton. The major colony occurs at Mount Etna (Department of Agriculture Water and the Environment, 2020b).	**Unlikely.** Suitable roosting habitat does not exist within the Project Site; however, some potential habitat may exist within rocky outcrops to the west of ML 1775. As this species is known to forage up to several kilometres from roost sites, the Project Site may provide suitable foraging habitat. Nonetheless, no database records are available from Wildlife Online or Atlas of Living Australia within 50 km of the Project Site.
Nyctophilus corbeni	South-eastern Long-eared Bat	V	V	The South-eastern Long-eared Bat (*Nyctophilus corbeni*) is found in a wide range of inland woodland vegetation types. These include box/ironbark/cypress pine woodlands, *Allocasuarina luehmannii* woodlands, *Acacia harpophylla* woodland, *Casuarina cristata* woodland, *Angophora costata* woodland, *Eucalyptus camaldulensis* forest, *Eucalyptus largiflorens* woodland, and	**Unlikely.** Although some suitable habitat does exist within the Project Site, the Project Site is outside of the known distribution. No Wildlife Online or Queensland Museum database records.

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				various types of tree mallee. This species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches. The South-eastern Long-eared Bat (*Nyctophilus corbeni*) is found in southern central Queensland, central western New South Wales, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin. Most records are from inland of the Great Dividing Range (Department of Agriculture Water and the Environment, 2020b).	
Petauroides volans	Greater Glider	V	-	During the day, this species spends most of its time denning in hollowed trees, with each animal inhabiting up to twenty different dens within its home range. It is primarily folivorous, with a diet mostly comprising the leaves and flowers of Myrtaceae (e.g. eucalypt) trees. The Greater Glider (*Petauroides volans*) is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The Greater Glider (*Petauroides volans*) is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. An isolated inland subpopulation occurs in the Gregory Range west of Townsville, and another in the Einasleigh (Department of Agriculture Water and the Environment, 2020b).	**Known.** Greater Glider (*Petauroides volans*) was located in mature *Eucalyptus camaldulensis* (River Red Gum) woodlands fringing Phillips Creek in the south of the Project Site by SKM (2012) and a total of 19 records were made along Boomerang Creek, Hughes Creek and in adjacent *Eucalyptus* and *Corymbia* open woodland by AECOM (2020). Several records are available from ALA approximately 10 km west of the Project Site and the species was recorded from Peak Downs Mine East to the north of the Project Site by AECOM in 2018.
Phascolarctos cinereus	Koala	V	V	Koalas (*Phascolarctos cinereus*) inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by species from the genus *Eucalyptus*. Koalas (*Phascolarctos cinereus*) eat a variety of eucalypt leaves and a few other related tree species, including *Lophostemon*, *Melaleuca* and *Corymbia* species. Koalas (*Phascolarctos cinereus*) are found in higher densities where food trees are	**Known.** One Koala (*Phascolarctos cinereus*) was recorded within the Project Site during the AECOM 2020 survey and two records also exists directly adjacent to the Project Site from previous surveys. One record of Koala (*Phascolarctos cinereus*) is also available from

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				growing on more fertile soils and along watercourses. They do, however, remain in areas where their habitat has been partially cleared and in urban areas. In Queensland, the Koala's (*Phascolarctos cinereus*) distribution extends inland from the east coast: from the Wet Tropics interim biogeographic regionalisation of Australia bioregion, into the Einasleigh Uplands bioregion; from the Central Mackay Coast bioregion, through the Brigalow Belt North bioregion to the Desert Uplands and Mitchell Grass Downs bioregions, and from the South-east Queensland bioregion, through the Brigalow Belt to the Mulga Lands and Channel Country bioregions in the southwest of the State (Department of Agriculture Water and the Environment, 2020b).	Atlas of Living Australia (2014); approximately 4 km west of the Project Site. Suitable habitat is widely available in communities dominated by *Corymbia* and *Eucalyptus* species.
Pteropus poliocephalus	Grey-headed Flying-fox	V	-	Grey-headed Flying-foxes (*Pteropus poliocephalus*) occupy the coastal lowlands and slopes of south-eastern Australia from Bundaberg to Geelong and are usually found at altitudes < 200 m. Areas of repeated occupation extend inland to the tablelands and western slopes in northern New South Wales and the tablelands in southern Queensland. Grey-headed Flying-foxes (*Pteropus poliocephalus*) require a continuous sequence of productive foraging habitats, the migration corridors or stopover habitats that link them, and suitable roosting habitat within nightly commuting distance of foraging areas. Areas supporting these characters are considered to be habitat critical to the survival of the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Department of Agriculture Water and the Environment, 2020b).	**Unlikely.** The Project Site is approaching the western limit of the species' range and no records are available within 100 km.
Tachyglossus aculeatus	Short-beaked Echidna	-	SLC	Short-beaked Echidnas (*Tachyglossus aculeatus*) are usually found among rocks, in hollow logs and in holes among tree roots. During rainy or windy weather, they often burrow into the soil or shelter under bushes and tussocks of grass.	**Known**. Short-beaked Echidna (*Tachyglossus aculeatus*) was recorded within the Project Site during the SKM field survey in 2007 and is

Scientific Name	Common Name	EPBC Act Status[1]	NC Act Status[2]	Habitat/distribution	Likelihood of Occurrence
				They are Australia's most widespread native mammal, being found in almost all habitats, from snow covered mountains to deserts. They are also common in urban areas, although their camouflage can make them very difficult to see.	known within the region from ALA records. The species does not have specialised habitat requirements, other than a sufficient food supply of ants and termites. They can persist in modified landscapes where felled timber provides a source of insects.
Fish					
Maccullochella peelii	Murray Cod	V	-	Murray Cod (*Maccullochella peelii*) are frequently found in the main channels of rivers and larger tributaries. This species is, therefore, considered a main-channel specialist. Preferred microhabitat consists of complex structural features in streams such as large rocks, snags (pieces of large submerged woody debris), overhanging stream banks and vegetation, tree stumps, logs, branches and other woody structures. The natural distribution of the Murray Cod (*Maccullochella peelii*) is within the Murray-Darling Basin extending from southern Queensland through the south-eastern States and territories. Within Queensland, many attempts at translocation have resulted in some introduced populations existing in the Burnett and Fitzroy River basins and the Cooper Creek system (Department of Agriculture Water and the Environment, 2020b).	**Unlikely.** The Project Site is not within the natural distribution of the species or the known areas of introduced populations. No records are available within 20 km of the Project Site.

[1] Conservation status under the EPBC Act: CE (critically endangered), E (endangered), V (vulnerable), Mi (migratory)

[2] Conservation status under the NC Act: E (endangered), V (vulnerable), NT (near threatened), SLC (special least concern)

5.1.3.2 Listed migratory species

Fourteen migratory fauna species listed under the EPBC Act were identified in the database search results and literature review for the Project Site. These species were evaluated to determine which species are known, likely, potential, unlikely or no potential to occur within the Project Site. This evaluation was based on an understanding of the preferred habitats of the species, knowledge of the type and condition of habitats present at the Project Site, and the results of previous Saraji Mine fauna surveys (e.g. SKM). These evaluations are presented in Table 23.

Out of the fourteen species, four have been recorded by EcoServe in 2005 during surveys of the Saraji Mine. These species are considered to be ‘known’ occurrences.

The full list of database search results is provided in Appendix A.

Table 23 Listed Migratory Species Potentially Occurring within the Project Site

Scientific Name	Common Name	EPBC Act Status [1]	NCA Status [2]	Habitat/distribution	Likelihood of Occurrence
Apus pacificus	Fork-tailed Swift	Mi	SLC	Fork-tailed Swift (*Apus pacificus*) primarily occurs over inland plains but is known to utilise diverse habitat from coastal foothills, cliffs, beaches, urban areas, riparian woodland, heathland, treeless grassland, spinifex covered sandplains, open farmland, dunes, low scrub, heathland, saltmarsh and tea-tree swamps (DEE, 2016b). The species is found across northern Australia and may use wooded areas and open plains within the Project Site. Aerial only. Non-breeding habitat only.	**Known.** Previously recorded over Saraji Mine. The species may forage and disperse over the Project Site, however the species does not breed in Australia.
Actitis hypoleucos	Common Sandpiper	Mi	SLC	The Common Sandpiper (*Actitis hypoleucos*) is known to occur in a range of wetland environments, both coastal and inland. Their primary habitat is rocky shorelines and narrow muddy margins of billabongs, estuaries and mangroves. Found along all coastlines of Australia and in many areas inland, the Common Sandpiper (*Actitis hypoleucos*) is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia.	**Unlikely.** Small areas of marginal foraging habitat occur within farm dams. The closest record is from 50 km southeast of the Project Site.
Calidris acuminata	Sharp-tailed Sandpiper	Mi	SLC	The Sharp-tailed Sandpiper (*Calidris acuminata*) inhabits the shallow, muddy edges of a range of wetlands in fresh and brackish waters. These include billabongs, soaks, bore swamps, lakes and sewage farms inland and coastal lakes, swamps and lagoons (DoEE, 2017f; Morcombe, 2004).	**Potential**. Records indicate the species is predominately recorded in coastal areas or recorded at large wetlands, however marginal foraging habitat is present within wetlands in the Project Site and a record from a dam at Peak Downs Mine is available.

Scientific Name	Common Name	EPBC Act Status [1]	NCA Status [2]	Habitat/distribution	Likelihood of Occurrence
Calidris ferruginea	Curlew Sandpiper	Mi, CE	SLC	Inhabits intertidal mudflats of estuaries, lagoons, mangrove channels in sheltered coastal areas. Recorded inland around ephemeral and permanent lakes, dams, waterholes.	**Potential.** Wetlands in the north of the Project Site may provide limited suitable habitat. No records are available from previous surveys and no records from Wildlife Online or Atlas of Living Australia databases are available within 10 km. The nearest recorded inland occurrences are at Lake Maraboon, 125 km south of the Project Site.
Calidris melanotos	Pectoral Sandpiper	Mi	SLC	This species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. In Queensland, most records for the Pectoral Sandpiper (*Calidris melanotos*) occur around Cairns. There are scattered records elsewhere, mainly from east of the Great Divide between Townsville and Yeppoon. Records also exist in the south-east of the State as well as a few inland records at Mount Isa, Longreach and Oakey.	**Unlikely.** Small areas of marginal habitat are available within farm dams and wetlands, closest record is approximately 50 km southeast of the Project Site
Cuculus optatus	Oriental Cuckoo	Mi	SLC	The Oriental Cuckoo (*Cuculus optatus*) is known from monsoon forest, rainforest edges, vine scrub, riverine thickets, wetter, densely canopied eucalypt forest, paperbark swamp and mangroves (Morcombe, 2004). This species does not breed in Australia.	**Unlikely.** Habitat within the Project Site is generally not suitable for the species. No records are available from previous surveys and no nearby records from Wildlife Online or Atlas of Living Australia.

Scientific Name	Common Name	EPBC Act Status [1]	NCA Status [2]	Habitat/distribution	Likelihood of Occurrence
Gallinago hardwickii	Latham's Snipe	Mi	SLC	In Australia, Latham's Snipe (*Gallinago hardwickii*) occurs in permanent and ephemeral wetlands up to 2,000 m above sea-level. They usually inhabit a variety of freshwater or brackish wetlands, preferring to be close to protective vegetation cover. Latham's Snipe (*Gallinago hardwickii*) is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia. The range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range in New South Wales.	**Known.** Previously recorded from Saraji Mine by EcoServe in 2005. Small patches of suitable habitat may be available within the Project Site. No nearby records are available from Wildlife Online or Atlas of Living Australia databases within 10 km.
Hirundapus caudacutus	White-throated Needletail	Mi	SLC	Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains.	**Known.** Previously recorded in the airspace over Saraji Mine. The species is almost exclusively aerial and does not breed in Australia. It may use the airspace above the Project Site for foraging and dispersal.
Hydroprogne caspia	Caspian Tern	Mi	SLC	The Caspian Tern (*Hydroprogne caspia*) is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. Widespread in coastal regions from the southern Gulf of Carpentaria to the Torres Strait, and along the eastern coast. Recorded in the western districts, especially the Lake Eyre Drainage Basin, north-west to the Gulf Country north of Mt Isa and Cloncurry, there are also scattered records for central Queensland.	**Known.** Previously observed at Saraji Mine foraging over the evaporation dam on the eastern side of the mining lease. This species is likely to occur over suitable wetland habitat and dams

Scientific Name	Common Name	EPBC Act Status [1]	NCA Status [2]	Habitat/distribution	Likelihood of Occurrence
Monarcha melanopsis	Black-faced Monarch	Mi	SLC	The species can be found in wet forest specialist, found mainly in rainforest and wet sclerophyll forest, especially in sheltered gullies and slopes with a dense understorey of ferns and shrubs' (DoE, 2015b). In Queensland, it is widespread from the islands of the Torres Strait and on Cape York Peninsula, south along the coasts (occasionally including offshore islands) and the eastern slopes of the Great Divide, to the New South Wales border	**Unlikely.** No suitable habitat occurs within the Project Site and no nearby Wildlife Online or Atlas of Living Australia database records exist.
Motacilla flava	Yellow Wagtail	Mi	SLC	Yellow Wagtail (*Motacilla flava*) are known from open country near swamp margins, sewage ponds, salt marshes, grassed surroundings of airfields and rarely on drier inland plains (Morcombe, 2004). Do not breed in Australia.	**Unlikely**. No nearby Wildlife Online or Atlas of Living Australia database records and no records from previous surveys. Suitable habitat is not available within the Project Site.
Myiagra cyanoleuca	Satin Flycatcher	Mi	SLC	In Queensland, it is widespread but scattered in the east, being recorded on passage on a few islands in the western Torres Strait. It is patchily recorded on Cape York Peninsula, from the Cape south to a line between Aurukun and Coen. The species is more widespread farther south, though still scattered, from Musgrave Station, mostly in coastal areas, but also on the Great Divide, and occasionally further west (Blakers *et al.* 1984). Satin Flycatchers (*Myiagra cyanoleuca*) are widespread in south-eastern Queensland, in the area from Fraser Island, west to Goombi and south to the NSW border.	**Unlikely**. No nearby Wildlife Online or Atlas of Living Australia database records. The Satin Flycatcher (*Myiagra cyanoleuca*) may occur in eucalypt and riparian woodlands across the Project Site.
Pandion haliaetus	Osprey	Mi	SLC	This species is found along coastlines, estuaries, lagoons, reefs, rock cliffs, bays, inlets, islands and other areas surrounding water. The species range extends from Esperance in Western Australia to NSW, where records become scarcer towards the south, and into Victoria and Tasmania, where the species is a rare vagrant.	**Unlikely**. No nearby Wildlife Online or Atlas of Living Australia database records. No suitable habitat appears available within the Project Site.

Scientific Name	Common Name	EPBC Act Status [1]	NCA Status [2]	Habitat/distribution	Likelihood of Occurrence
Tringa nebularia	Common Greenshank	Mi	SLC	Species is found inland in floodplains, swamps, lakes, permanent and temporary wetlands. The species is widespread in the Gulf country and eastern Gulf of Carpentaria. It has been recorded in most coastal regions, possibly with a gap between north Cape York Peninsula and Cooktown. Inland, there have been a few records south of a line from near Dalby to Mt Guide, and sparsely scattered records elsewhere	**Potential**. Several small wetlands are present within the Project Site which may be utilised by this species. It has not been identified in previous surveys however a record does exist from Atlas of Living Australia at the Peak Downs tailings dam north of the Project Site.

[1] Conservation status under the EPBC Act: CE (critically endangered), Mi (migratory)

[2] Conservation status under the NC Act: SLC (Special Least Concern).

5.1.4 Historical ecological reports

BMA has previously undertaken a series of ecological assessments for development and management of the existing Saraji Mine. A total of 282 terrestrial vertebrate fauna species have been recorded from the habitats of Saraji Mine from previous studies (WBM 1999; WBM 2002; WBM 2003; EcoServe 2005; EcoServe, 2006), including 47 mammal, 48 reptile, 21 frog and 166 bird species.

Fauna surveys undertaken in 2006, 2008 and 2009 identified three conservation significant, migratory or otherwise significant fauna species. A Koala (*Phascolarctos cinereus*) was observed within riparian vegetation along Lake Lester and Plumtree Creek. A Squatter Pigeon (*Geophaps scripta scripta*) was recorded on the entrance track to the Lisgard area of Saraji Mine and a pair of Caspian Terns (*Hydroprogne caspia*) were observed foraging over the evaporation dam on the eastern side of Saraji Mine. (EcoServe 2006, 2008, 2009).

5.2 Field survey results

5.2.1 Fauna habitats

The habitat landscape within the Project Site has been significantly altered from its original state; the majority of the area is cleared for grazing land and improved pasture. The current habitat landscape comprises cleared grazing land dominated by the exotic grass species *Cenchrus ciliaris** (Buffel Grass) traversed by narrow remnants of riparian woodlands. There are larger patches of remnant woodlands in the northern section of the Project Site, connected to more extensive areas of habitat to the north. Fauna habitat that does persist has been subject to disturbance from cattle grazing, selective clearing, weeds and pests. This has led to a general lack of native understorey growth in the remnant woodlands. However, thinning has resulted in an accumulation of ground habitats in the form of logs and large branches. Despite signs of habitat degradation, several fauna habitat values exist.

Nine distinct habitat types were recorded within the Project Site (Table 24; Figure 14). A description of these communities and the key fauna habitat opportunities are provided below.

Table 24 Fauna habitat types within the Project Site

Habitat Type	Habitat Summary	Analogous REs	Project Site (ha)	Project Footprint (ha)
1	River Red Gum Riparian Woodland	11.3.25	192.08	73.42
2	*Eucalyptus* and/or *Corymbia* Open Woodland	11.3.2, 11.3.4, 11.4.13; 11.5.3	1,876.46	882.21
3	Dawson Gum and Brigalow Woodland	11.4.8	322.35	222.45
4	Brigalow or Belah Woodland	11.3.1, 11.4.9	204.33	39.15
5	Oxbow Wetland	11.3.27b	16.64	3.04
6	Natural Grasslands	11.4.4	1.73	0.075
7	Modified Grasslands	Non-remnant	6,418.86	1,420.13
8	Shrubby Brigalow regrowth with Gilgai	Non-remnant	1,781.99	636.89
9	Dams	Non-remnant	107.66	70.72

5.2.1.1 River red gum riparian woodland

This habitat type comprises alluvial riparian forest, analogous with RE 11.3.25 along the major creeks and drainage lines, including Boomerang Creek, Plumtree Creek, Hughes Creek, One Mile Creek and Phillips Creek. This community is defined by a tall, open canopy of *Eucalyptus camaldulensis* (River Red Gum), over a mid-storey of *Casuarina cunninghamiana* (River She-oak)*, Corymbia tessellaris* (Moreton Bay Ash) and *Melaleuca fluviatilis* with an abundance of grasses along the stream banks. Large, mature *Eucalyptus camaldulensis* (River Red Gum) present in riparian habitats frequently

contain hollow limbs which provide denning sites for arboreal mammals and microchiropteran bat species and nesting sites for many bird species such as parrots and owls. Notably two threatened species were recorded in this habitat, the Greater Glider (*Petauroides volans*) and Koala (*Phascolarctos cinereus*).

This community also acts as a food source for insectivorous and nectivorous birds and mammals. Where this habitat forms a continuous corridor, it constitutes a route for migratory and dispersing fauna of all types. Ground timber, high ground cover and decorticating bark also provide habitat opportunities for reptiles and ground-dwelling mammals.

Seasonal inundation and flow along the creeks and their tributaries also provides habitat and breeding sites for aquatic or semi-aquatic species such as frogs and their predators such as snakes. Four amphibians were recorded in this habitat type including Ornate Burrowing Frog (*Platyplectrum ornatum*), Short-footed Frog (*Cyclorana brevipes*) and the invasive Cane Toad (*Bufo marinus**) which was noted in large numbers along Phillips Creek. A Keelback Snake (*Tropidonophis mairii*) was observed hunting Cane Toads (*Bufo marinus**) in the dry creek bed of Phillips Creek and a Common Tree Snake (*Dendrelaphis punctulata*) was also recorded in this habitat.

5.2.1.2 Eucalyptus and/or Corymbia open woodland

This habitat type occupied large areas of remnant woodland in the north and centre of the Project Site with smaller isolated patches in the south. It is analogous with REs 11.3.2, 11.3.4, 11.5.3 and 11.4.13. This community is defined by a canopy comprising Myrtaceous tree species including *Eucalyptus populnea* (Poplar Box), *Eucalyptus orgadophila* (Mountain Coolibah), *Corymbia dallachiana* (Ghost Gum), *E. melanophloia* (Silver-leaved Ironbark), *Corymbia clarksoniana, Corymbia tessellaris* (Moreton Bay Ash) and *Corymbia erythrophloia* (Variable-barked Bloodwood). The lower tree layer is sparse primarily due to the cattle damage while the ground layer typically displayed high cover of native and exotic grass species and low shrubs (i.e. *Carissa ovata* (Currant Bush)).

Eucalyptus populnea (Poplar Box) readily forms hollows and hollows in stags were also common where *Eucalyptus orgadophila* (Mountain Coolibah) dominates. As a result, many trees within these communities possessed one or more such habitat features. Despite this, arboreal mammal diversity was found to be relatively low in this habitat type with the exception of microchiropteran bat species which were regularly recorded.

A Koala (*Phascolarctos cinereus*) record also occurs in this habitat type within Downs Creek, downstream of the Project Site. Thinning of this community has resulted in an accumulation of fallen timber, including large branches and logs, which provide habitat opportunities for reptiles and ground mammals.

Opportunities exist for a range of birds in this habitat include foraging habitat for foliage-gleaners, nectar feeders and raptors. Raptors including Wedge-tailed Eagle (*Aquila audax*) and Pacific Baza (*Aviceda subcristata*) were observed soaring above or perched in the canopy and Brolgas (*Grus rubicunda*) and Emu (*Dromaius novaehollandiae*) were also noted moving through the ground layer in this habitat type.

5.2.1.3 Dawson gum and brigalow woodland

This community is analogous with RE 11.4.8 and occurs as fragmented patches across the Project Site. It comprises an open canopy of *Eucalyptus cambageana* (Dawson Gum) with a lower tree layer of *Acacia harpophylla* (Brigalow) and *Lysiphyllum carronii* (Queensland Ebony), and a relatively diverse shrub layer. This community typically features a mid-dense shrub layer that is attractive to woodland bird species. Hollows form in large *Eucalyptus cambageana* (Dawson Gum) and stags which provide valuable habitat for arboreal mammals, microchiropteran bats, parrots and owls. Habitat logs, ground timber and decorticating bark were common and leaf litter cover was typically high, providing habitat resources for reptiles and amphibians. Like the majority of habitat found within the Project Site, these communities are heavily impacted by cattle. The presence of cattle and *Cenchrus ciliaris** (Buffel Grass) may deter some ground fauna from utilising these areas.

5.2.1.4 Brigalow or Belah woodland

This community occurs as small, fragmented patches across the Project Site and is analogous with RE 11.3.1 and RE 11.4.9. *Acacia harpophylla* (Brigalow) or *Casuarina cristata* (Belah) forms a closed canopy often with emergent eucalypt species. Structural complexity was typically high with well-defined

shrub and ground layers. Microhabitat features typically include high leaf litter cover, grass tussocks, ground timber and habitat logs. Gilgai formation was observed in some areas and cracking clay also provides opportunities for some amphibian and reptile species including the vulnerable Ornamental Snake (*Denisonia maculata*). During years of high rainfall or after the wet season, Gilgai depressions fill with and maintain water which in turn fosters an increase in local biodiversity (i.e. frogs, snakes, aquatic vegetation and birds).

In the survey area patches of this habitat type were generally small, fragmented and heavily degraded by cattle grazing. They were also found to be generally low in fauna diversity. However, these areas traditionally offer refuge for a number of species that are typically associated with this community.

5.2.1.5 Oxbow wetland

This habitat type was found in several open and vegetated freshwater bodies in the north-east of the Project Site and is analogous with RE 11.3.27b. It is a fringing woodland and sedgeland dominated by *Eucalyptus camaldulensis* (River Red Gum) and *Lophostemon grandiflorus* (Swamp Box). This riparian community was noted to provide habitat opportunities for all fauna groups with hollows, flowering canopy trees, grassy banks, decorticating bark and ground timber observed. Large, mature *Eucalyptus camaldulensis* (*R*iver Red Gum) present in this habitat type frequently contain hollows in trunks and limbs, which provide denning sites for arboreal mammals and microchiropteran bats (nine species recorded) and nesting sites for many bird species such as parrots and owls. Further, tree hollows provide refuge and access to arboreal prey species targeted by reptiles such as arboreal snakes and monitors. Hollows in live trees also provide a stable moist environment, thermal conditions which may be beneficial to some reptile species (Fitzgerald *et al.*, 2010). Flowering canopy *Eucalypts* are also likely to support foraging birds and flying foxes, including the little Red Flying-fox (*Pteropus scapulatus*) which was recorded within this habitat.

This community provides suitable habitat for amphibians and a permanent water resource for macropods, with both detected during spotlighting and observational surveys. Two amphibian species were observed within this habitat including the Bumpy Rocket Frog (*Litoria inermis*) and Desert Tree Frog (*Litoria rubella*). The complex in stream habitat, including aquatic vegetation and woody debris, provided abundant foraging and breeding habitat opportunities. Two Eastern Brown Snakes (*Pseudonaja textilis*) were also observed exhibiting courting behaviour (Plate 8) on a farm track adjacent to the wetland.

Water bodies in the area, both natural and artificial, are attractive as watering points for woodland bird species and provide habitat for a number of waterbird and frog species. Waterbirds noted using this habitat included Little Pied Cormorant (*Phalacrocorax melanoleucos*) and Australian Pelican *(Pelecanus conspicillatus*) and woodland bird species which show preference for areas in close proximity to waterbodies included Rainbow Bee-eater (*Merops ornatus*) and Dollarbird (*Eurystomus orientalis*). Nocturnal predatory birds were also noted using this habitat (Southern Boobook (*Ninox boobook*); Tawny Frogmouth (*Podargus strigoides*)) with suitable amphibian, insect and bat prey species widely available.

Although not noted during surveys, such permanent waterbodies in the area are also important in promoting the survival and proliferation of feral animals such as Feral Pig (*Sus scrofa**) and Cane Toad (*Bufo marinus**).



Plate 8 Eastern Brown Snakes (*Pseudonaja textilis*) observed adjacent to oxbow wetland

5.2.1.6 Natural grasslands

This community occurs as a small patch in the middle of the Project Site mapped as RE 11.4.4 and comprises a mixture of native grasses and herbs on black clay. Although no detailed fauna surveys were conducted in this area, common bird species such as Torresian Crow (*Corvus orru*), Magpie-lark (*Grallina cyanoleuca*) and Whistling Kite (*Haliastur sphenurus*) were noted using this community. Notably a large herd of Feral Pigs (*Sus scrofa**) was recorded moving through the grassland and some previous pig damage was evident.

5.2.1.7 Modified grasslands

The grasslands found within the Project Site mostly exist as a relic from clearing practices and form the largest community type (approximately 64 per cent of the Project Site). The introduced pasture species *Cenchrus ciliaris** (Buffel Grass) dominates much of this community, although patches of native grasses still exist in places. *Cenchrus ciliaris** (Buffel Grass) does not provide preferred habitat for native ground fauna. However, the modified grasslands support a range of larger mammal species such as the Grey Kangaroo (*Macropus giganteus*) and specialist grassland bird species such as the Nankeen Kestrel (*Falco cenchroides*), Tawny Grassbird (*Megalurus timoriensis*) and the Australasian Pipit (*Anthus novaeseelandiae*). The presence of native grasses found in isolated patches (as described in Natural grasslands above) in the southern area of the Project Site would typically offer better habitat values for native dasyurids, murids and herpetofauna.

In some areas gilgai micro-relief and cracking clays are present. This provides suitable habitat for frog species and the vulnerable Ornamental Snake (*Denisonia maculata*).



Plate 9 Modified grasslands typical of the Project Site

5.2.1.8 Shrubby brigalow regrowth with gilgai

Patches of shrubby *Acacia harpophylla* (Brigalow) and *Eucalyptus cambageana* (Dawson Gum) regrowth exist throughout Project Site, ranging from 0.5 m to 5 m in height. Microhabitat features include ground timber accumulation where clearing has taken place with some leaf litter, grass tussocks and gilgai. Where cracking clay and gilgai are present opportunities for reptile and amphibian species such as Green Tree Frog (*Litoria caerulea*) (Plate 11) and the vulnerable Ornamental Snake (*Denisonia maculata*) exist. Ornamental Snake (*Denisonia maculata*) was recorded in this habitat type by AECOM in 2020 and by SKM after rainfall.

Weed disturbance was found to be high in this habitat type and patches were often found to be heavily disturbed by feral animals such as Feral Pig (*Sus scrofa**) and livestock (Cattle (*Bos taurus**)).



Plate 10 ***Acacia harpophylla*** **(Brigalow) regrowth with gilgai within the Project Site**



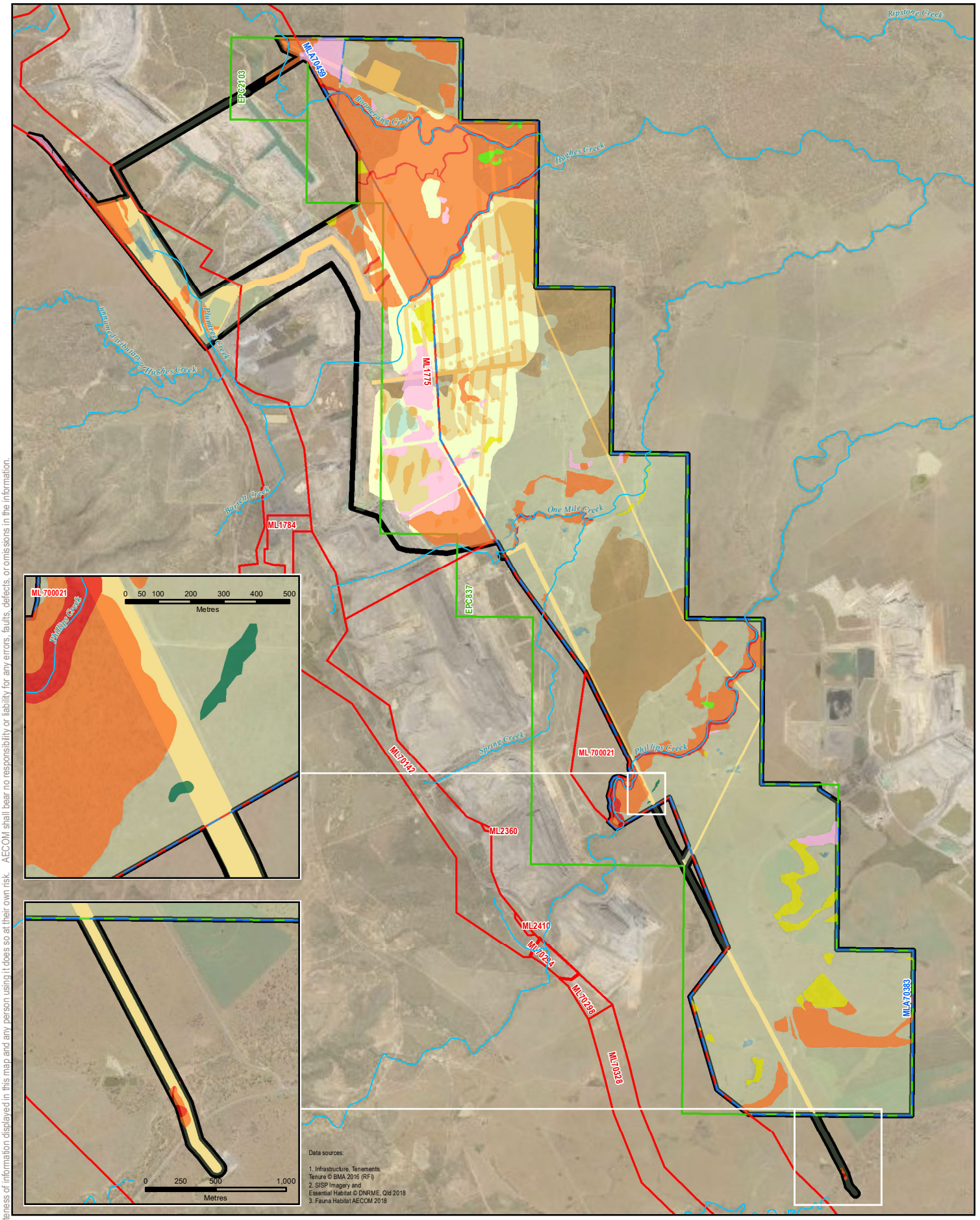
Plate 11 **Green Tree Frog (*Litoria caerulea*) taking refuge in an Eastern Grey Kangaroo (*Macropus giganteus*) track in gilgai within regrowth *Acacia harpophylla* (Brigalow)**

5.2.1.9 Dams

This habitat type is characterised by open water bodies with limited aquatic vegetation, exposed mud and cattle impacts. As all watercourses within the Project Site are ephemeral and natural waterholes are uncommon, farm dams (and mine dams) act as reliable water sources and refugia for fauna throughout the year. Bird diversity was particularly high at some dams with species such as Black-necked Stork (*Ephippiorhynchus asiaticus*) and Pied Cormorant (*Phalacrocorax varius*) only observed in this habitat type.



Plate 12 Large farm dam in the south of the Project Site



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Fauna habitat types

- River red gum riparian woodland
- Eucalyptus and/or Corymbia open woodland
- Dawson gum and brigalow woodland
- Brigalow or belah woodland
- Oxbow wetland
- Natural grasslands

Non-remnant Habitat Types

- Modified Grasslands
- Shrubby Brigalow Regrowth with Gilgai
- Dams

N

Figure 14
Fauna habitat types within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

BMA
BHP Mitsubishi Alliance

DATE: 31/05/2024 VERSION: 6

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

5.2.1.10 Habitat connectivity

Riparian corridors associated with Boomerang Creek, Hughes Creek, One Mile Creek, and Phillips Creek provide east–west fauna movement opportunities through the landscape. The functional habitat connectivity in an east to west direction in a regional context is interrupted by the Saraji Mine complex directly west of the Project Site. However, to the east and west of the Saraji Mine complex, there are opportunities for fauna movement despite the historical clearing of woodland for grazing.

The northern portion of the Project Site also forms part of a large contiguous area of remnant vegetation which provides significant faunal dispersal opportunities to the north and east. The Project Site is bisected by the Lake Vermont Mine Road and railway corridor as well as Golden Mile Road in the southern extent, and movement opportunities for fauna through the landscape north-south are limited.

5.2.2 Fauna species richness

A total of 188 vertebrate fauna species were recorded during the 2007, 2010, 2011, 2016, 2017 and 2020 field surveys, comprising 14 amphibians (including one exotic species), 24 reptiles, 117 birds and 33 mammals (including seven exotic species). A composite fauna list is provided in Appendix C and a discussion of the diversity of the four main terrestrial vertebrate groups (birds, mammals, reptiles, amphibians) is provided in the following sections.

5.2.2.1 Amphibians

A total of 14 species of amphibian were found including one exotic species: the Cane toad (*Bufo marinus**). Several species, including New Holland Frog (*Cyclorana novaehollandiae*), Striped Burrowing Frog (*Cyclorana alboguttata*), Ornate Burrowing Frog (*Platyplectrum ornatum*), Green Tree Frog (*Litoria caerulea*), Bumpy Rocket Frog (*Litoria inermis*) and Desert Tree Frog (*Litoria rubella*) were routinely encountered near creeks, dams and billabongs. Of particular note was the capture of over 88 Ornate Burrowing Frogs (*Platyplectrum ornatum*), from one night of pitfall trapping on Boomerang Creek. Amphibian activity throughout the 2010 autumn survey period was very high, correlated with the prolonged summer rains.

The Project Site provides suitable habitat for a diversity of amphibians despite the intensive grazing pressures. Creeks and billabongs are fringed by remnant woodlands and sedgelands which provide habitat for stream-breeding frogs. The remnant woodlands, particularly within floodplains, provide habitat for open grassland species (such as striped burrowing frog and spotted grass frog) after good rainfall events. Farm dams also provide habitat for some frog species, however the extent of bare ground in the riparian zone and the extent of emergent vegetation cover may impact the usability of the habitat for some species. Gilgai formations with cracking clays in modified grasslands and remnant and non-remnant *Acacia harpophylla* (Brigalow) communities also provide food habitat and breeding opportunities for frogs as they hold water well into the dry season.

5.2.2.2 Reptiles

A total of 24 species of reptile were found, including seven geckos, five skinks, one dragon and eleven snakes. One species, the Ornamental Snake (*Denisonia maculata*) is listed as vulnerable under the EPBC Act and NC Act (see Section 5.2.3 for further information). During the 2020 field surveys, this species was recorded within Brigalow fringed gilgai which retained low levels of water derived from recent rainfall. This species is likely to utilise a range of habitats (remnant and non-remnant) across the Project Site where gilgai depressions are found. This species is likely to take advantage of water-dependent frogs which proliferate during times of inundation.

Patches of *Eucalyptus cambageana* (Dawson Gum)/*Acacia harpophylla* (Brigalow) woodland and *Casuarina cristata* (Belah) woodland provided good habitat for reptiles despite disturbance by cattle grazing, with moderate availability of shelter sites including leaf litter, fallen bark and branches, and rotting logs.

Within open woodlands dominated by *Eucalyptus* and *Corymbia* species ground timber, high ground cover and decorticating bark also provide habitat opportunities for reptiles.

5.2.2.3 Birds

A total of 117 species of bird were observed across the Project Site including two conservation significant species and four listed migratory species (see Appendix C). The Squatter Pigeon (*Geophaps scripta scripta*), listed as vulnerable under the EPBC Act and NC Act, was observed along a powerline track on MLA 70383 (Figure 11). The Australian Painted Snipe (*Rostratula australis*) listed as vulnerable under the EPBC Act was observed from an area of flooded *Acacia harpophylla* (Brigalow) woodland also in MLA 70383 (Figure 11) and a Grey Falcon (*Falco hypoleucos*) was recorded by EcoServe over the adjacent Saraji Mine.

The Project Site supports a diversity of open grassland and woodland birds that are reasonably common throughout central Queensland. Birds that were common in the open and lightly timbered pastures include Magpie (*Gymnorhina tibicen*), Magpie-lark (*Grallina cyanoleuca*), Butcherbirds (*Cracticus torquatus* and *Cracticus nigrogularis*), Torresian Crow (*Corvus orru*), Noisy Miner (*Manorina melanocephala*), Willie Wagtail (*Rhipidura leucophrys*), Peaceful Dove (*Geopelia placida*) and Crested Pigeon (*Geophaps lophotes)*. Granivorous (seed-eating) and insectivorous (insect-eating) birds were abundant throughout the Project Site in pastures and grasslands, including Australasian Pipit (*Anthus australis*), Golden-headed Cisticola (*Cisticola exilis*), Songlarks (*Cincloramphus* spp.) and Tawny Grassbird (*Megalurus timoriensis*). Smaller birds, including Finches (*Taeniopygia* spp. and *Neochmia* spp.) and Fairy-wrens (*Malurus* spp.) also occurred in more open habitats, however they preferred a shrubby understorey to provide some shelter. Birds that converged in riparian habitats include Red-winged Parrot (*Aprosmictus erythropterus*), Rosellas (*Platycercus* spp.), Lorikeets (*Trichoglossus* spp.), Kookaburras (*Dacelo* spp.), Kingfishers (*Todiramphus* spp.) and Friarbirds (*Philemon* spp.).

Several waterbirds were common within dam and wetland habitats including Ducks (*Anas* spp*., Dendrocygna* spp*.* and *Chenonetta sp*.), Herons (*Ardea* spp.), Australasian Darter (*Anhinga novaehollandiae*), Cormorants (*Phalacrocorax* spp.), Ibis (*Threskiornis* spp.) and Spoonbills (*Platalea* spp.).

Larger birds such as the Australian Bustard (*Ardeotis australis*), Emu (*Dromaius novaehollandiae*) and Brolga (*Grus rubicunda*) were commonly observed across the plains of the Project Site. Raptors that were frequently observed included Falcons (*Falco* spp.) and Kites (*Haliastur sphenurus* and *Milvus migrans*).

5.2.2.4 Mammals

Thirty-three species of mammal were identified during the field surveys including eight exotic species. Two mammals listed as vulnerable under the EPBC Act and the NC Act, the Greater Glider (*Petauroides volans*) and Koala (*Phascolarctos cinereus*) were recorded within the Project Site. The Greater Glider (*Petauroides volans*) requires habitat with a high abundance of medium to large sized hollows and a diversity of eucalypt species flowering throughout the year for food resources. Koalas (*Phascolarctos cinereus*) feed almost exclusively on the foliage of species from the genus *Eucalyptus*; however, they are also known to consume foliage of *Corymbia* spp., *Angophora* spp. and *Lophostemon* spp. Suitable habitat is widespread throughout the Project Site including riparian zones and open woodlands which reflect a similar habitat type to the Greater Glider (*Petauroides volans*). Additionally, Koalas (*Phascolarctos cinereus*) were observed in two locations both contiguous within suitable eucalypt woodland habitat within the Project Site.

The diversity of native mammal species is considered low, particularly with respect to small, ground-dwelling marsupials and rodents. The absence of this fauna group may be due to extensive fragmentation of habitats, abundance of predators (native and exotic), absence of shelter sites (i.e. lack of density and/or structure in the understorey vegetation) and/or extensive grazing.

The lack of diversity of other mammal groups, including macropods, was expected considering the highly-disturbed and fragmented habitats within the Project Site. These species are highly mobile through such landscapes.

Of the 33 mammal species recorded, 16 of these were bats which are considered below in Section 5.2.2.5.

5.2.2.5 Bats

A total of 16 bats were positively detected during the field surveys, including 15 microchiropteran bats and one Flying Fox. A further four microchiropteran bat species were potentially detected however recorded files of echolocation calls used for identification contain similar call characteristics of multiple species. None of the potentially detected species are considered to be of conservation significance.

Eight of the microchiropteran bats identified are known to roost in tree hollows and are likely to utilise roost sites within riparian *Eucalyptus camaldulensis* (River Red Gum) woodlands. The Little Bentwing Bat (*Miniopterus australis*), although a cave-dwelling species that congregates in summer into maternity colonies, is known to disperse during winter and may use tree hollows opportunistically (Churchill 2008). The White-striped Freetail Bat (*Tadarida australis*) roosts in disused mines, caves, boulder piles and rock fissures.

No suitable caves are available for roosting habitat within the Project Site; however, it is possible that these cave-dwelling bats are roosting in rocky outcrops to the southwest of the Project Site. It was also noted that bats were regularly seen flying around the entrance to the road tunnel on Lake Vermont Road at dawn and dusk where a roost site was established.

5.2.3 Fauna of conservation significance

5.2.3.1 Listed threatened species

Seven conservation significant fauna species listed as threatened under the EPBC Act and/or the NC Act were recorded in the Project Site. These species are listed in Table 25 and the location in which they were recorded is shown in (Figure 11). These species are discussed further below.

Table 25 Listed threatened species recorded within and adjacent to the Project Site

Common Name	Scientific Name	EPBC Act[1]	NC Act[2]
Ornamental Snake	*Denisonia maculata*	Vulnerable	Vulnerable
Australian Painted Snipe	*Rostratula australis*	Endangered	-
Squatter Pigeon (Southern)	*Geophaps scripta scripta*	Vulnerable	Vulnerable
Grey Falcon	*Falco hypoleucos*	-	Vulnerable
Greater Glider	*Petauroides volans*	Vulnerable	Vulnerable
Koala	*Phascolarctos cinereus*	Vulnerable	Vulnerable
Short-beaked Echidna	*Tachyglossus aculeatus*	-	Special Least Concern

[1] Conservation status under the EPBC Act at the time of submission of the Project EPBC Act referral

[2] Conservation status under the NC Act

Ornamental Snake (*Denisonia maculata*)

The Ornamental Snake (*Denisonia maculata*) is listed as vulnerable under the EPBC Act and NC Act.

The species feeds almost exclusively on frogs (Cogger *et al.*1993) and occurs in moist areas such as *Acacia harpophylla* (Brigalow) woodland on clay and sandy soils, riverside woodland, open forest on natural levees and where gilgai formations exist (Shine 1983; Cogger *et al.*1993 and Wilson & Knowles 1988). It is known only from the Brigalow Belt region and is known to occur at Saraji Mine.

The Ornamental Snake (*Denisonia maculata*) was recorded from five locations across the Project Site (Figure 15). Eleven records are known from ML 1775 in regrowth *Acacia harpophylla* (Brigalow) which has consequently been used in State-mapped Essential Habitat. Two individuals were detected in regrowth brigalow fringing gilgai with standing water east of eleven previously recorded ALA Ornamental Snake (*Denisonia maculata*) sightings. A third individual was spotlighted east of the previous two sightings and was detected in regrowth *Acacia harpophylla* (Brigalow) fringing gilgai with standing water. This individual was then seen to swim through the standing water to retreat from observation. Frog activity and diversity at both these locations was high. Known prey species identified by the DCCEEW (2023) and recorded during field surveys within habitat for the species include Green Tree Frog (*Litoria caerulea*), Desert Tree Frog (*Litoria rubella*), Water-holding Frog (*Cyclorana*

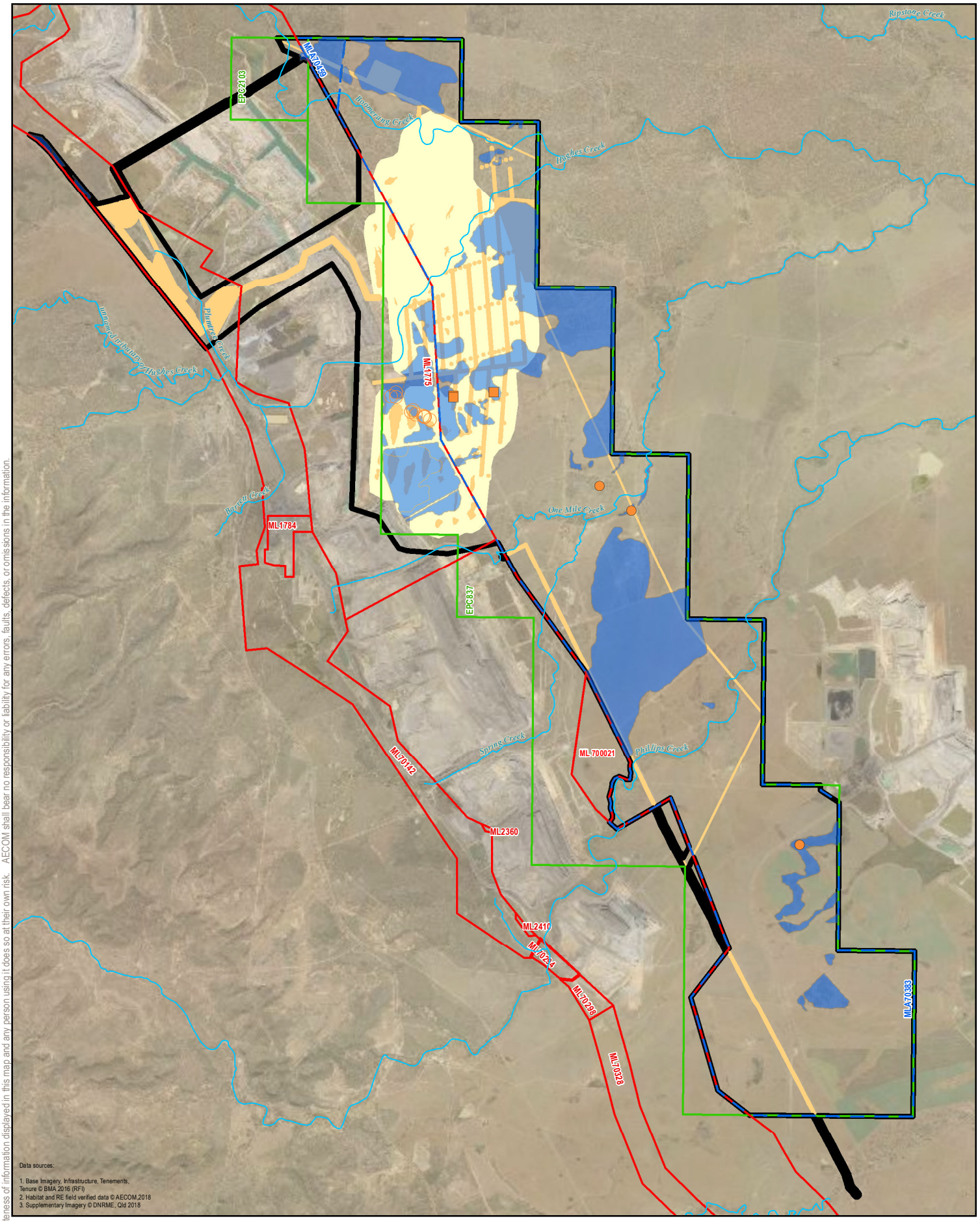
platycephala), Ornate Burrowing Frog (*Limnodynastes ornatus*) and Striped Burrowing Frog (*Cyclorana alboguttata*). A juvenile was also detected from a small patch of *Acacia harpophylla* (Brigalow) in the east of MLA 70383. The soils were predominantly black cracking clays, and standing water was evident in pools with some frog activity. An adult was detected from a small, sandy waterway fringed by degraded riparian vegetation to the south of Phillips Creek. No standing water was present although some frog activity was recorded. A further two juveniles were detected from a sandy waterway passing through *Casuarina cristata* (Belah) woodland. Some standing water and frog activity was evident at that location.

Based on BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell, et. al., 2020), the extent of potential habitat for the species is outlined in Table 26 and shown in Figure 15. Due to the lack of key microhabitat features (i.e. deep soil cracks and woody debris), no preferred habitat was identified within the Project Site.

Table 26 Potential habitat for Ornamental Snake (*Denisonia maculata*)

Habitat definition	Potential habitat type	Total area (ha) within the Project Site	Area (ha) within Project Footprint
Gilgai depressions (with or without the presence of brigalow or other canopy vegetation[1]), mounds and wetlands on cracking clays (predominantly land zone 4) where essential microhabitat features are present including an abundance of deep soil cracks and fallen woody debris. Seasonal flooding of habitat areas is a requirement.	Preferred	0	0
Dispersal areas within 1 km of preferred habitat currently or previously dominated by brigalow or coolabah communities where gilgais or soil cracks are infrequent or are shallow or non-remnant areas.	Suitable	2,276.31	886.02
Areas currently or previously dominated by brigalow or coolabah communities where gilgais or soil cracks are infrequent or are shallow or non-remnant areas where threats are high (high abundance of weed incursion and cattle compacting soils) but the species still have potential to occur, especially in times where water is present and prey abundance (frogs) is high.	Marginal	0	0
Total		**2,276.31**	**886.02**

[1] including remnant, regrowth and non-remnant areas as identified in the QLD vegetation mapping framework.



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Threatened Fauna Location

- Ornamental Snake (AECOM 2020)
- Ornamental Snake (SKM 2012)
- Ornamental Snake (DES and ALA 2023)
- Ornamental Snake suitable habitat

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Figure 15

Ornamental Snake potential habitat within Project Site

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Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Australian Painted Snipe (*Rostratula australis*)

The Australian Painted Snipe (*Rostratula australis*) is listed as Endangered under the EPBC Act.

The Australian Painted Snipe (*Rostratula australis*) is a wading bird found in wetland habitats. It has been recorded at wetlands in all States of Australia. It is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland, New South Wales, Victoria and south-eastern South Australia.

This species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. However, they have also been known to utilise areas lined with trees, as well as modified habitats such as low-lying woodlands converted to grazing pasture, sewage farms, dams, bores and irrigation schemes (Department of Agriculture Water and the Environment, 2020b).

Australian Painted Snipe (*Rostratula australis*) breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are nearly all from or near small islands in freshwater wetlands, provided that these islands are a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover.

This species was observed from an area of flooded *Acacia harpophylla* (Brigalow) woodland within the Project Site during SKM surveys in 2007. Potential habitat within the Project Site lacks the required microhabitat features to provide breeding habitat for this species. The species is likely to be a vagrant visitor only and may use wetlands in the Project Site on passage to more suitable breeding or foraging grounds.

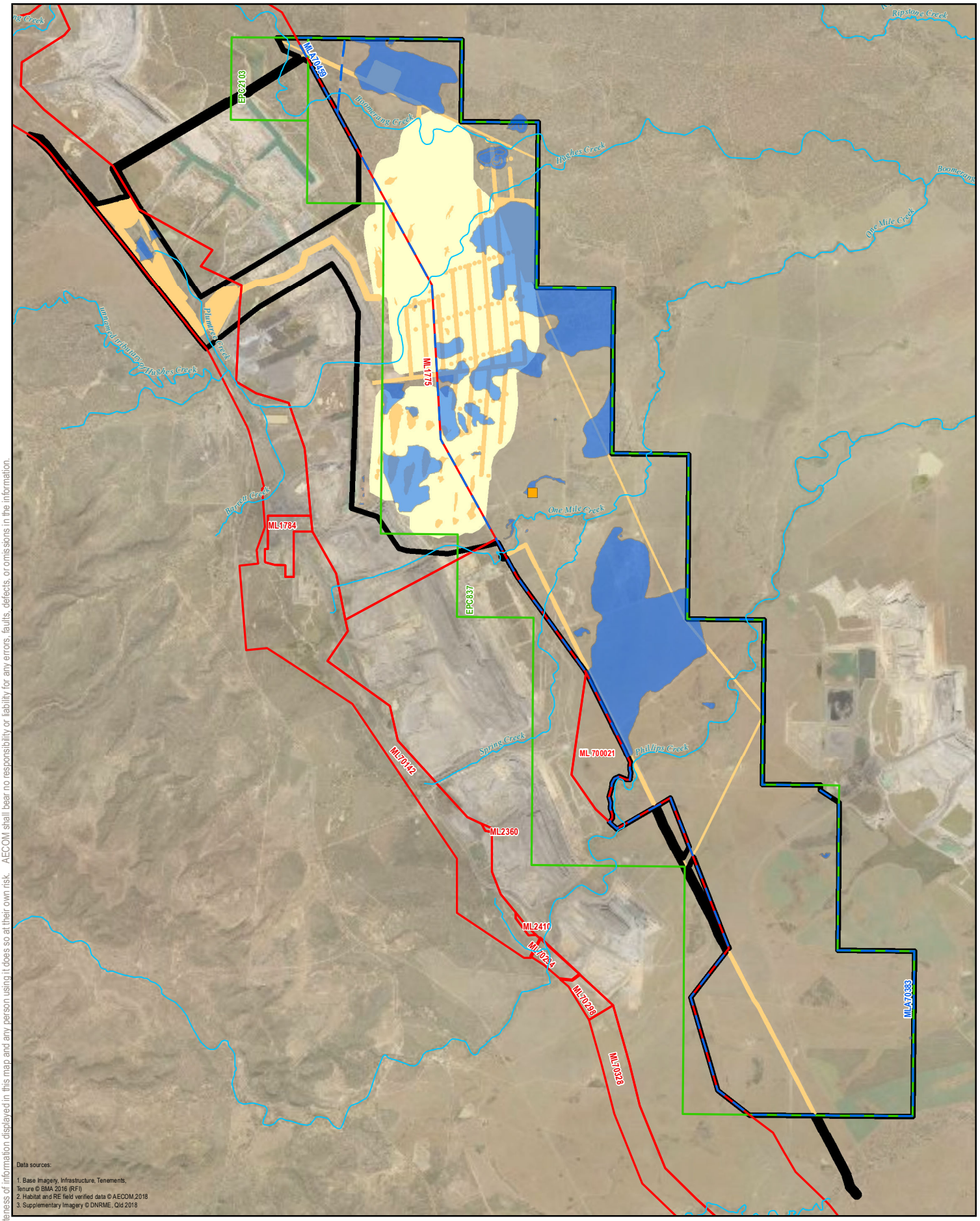
Based on BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell, et. al., 2020), the extent of potential habitat for the species is summarised in Table 27 and displayed in Figure 16.

Table 27 Potential habitat for Australian Painted Snipe (*Rostratula australis*)

Habitat definition	Potential habitat type	Total area (ha) within the Project Site	Area (ha) within Project Footprint
Shallow, permanent or ephemeral, freshwater wetlands which provide areas of bare, exposed wet mud and a mosaic of ground cover[1] (tufted grasses, sedges, small woody plants).	Preferred	0	0
Shallow permanent or ephemeral freshwater or brackish wetlands and other inundated/waterlogged areas[2] with a variable ground cover (e.g. grasses, shrubs and rushes). Habitat for this species does not include tall, dense reedbeds associated with stabilized water levels, wetlands that are cropped, and areas of low water quality due to nutrient run-off, agricultural chemicals and turbidity.	Suitable	1,931.88	712.97
Total		**1,931.88**	**712.97**

[1] May include rushes and sedges up to 1 m in height

[2] Can include gilgai, lakes, springs, swamps, claypans, inundated or waterlogged grassland/saltmarsh, dams, rice fields, sewage farms and bore drains.



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Threatened fauna location

- Australian Painted Snipe (SKM 2012)

Potential habitat

- Australian Painted Snipe suitable habitat

N

Figure 16
Australian Painted Snipe potential habitat within the Project Site

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Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

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Squatter Pigeon (Southern) (*Geophaps scripta scripta*)

The Squatter Pigeon (Southern) (*Geophaps scripta scripta*) is listed as Vulnerable under the EPBC Act and NC Act.

The Squatter Pigeon (Southern) (*Geophaps scripta scripta*) is a ground-dwelling bird that inhabits the grassy understorey of open woodland (mostly dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* in the canopy), as well as sown grasslands with scattered remnant trees, disturbed areas (such as roads, railways, settlements and stockyards), scrubland, and *Acacia* regrowth (Department of Agriculture Water and the Environment, 2020b).

In Queensland, foraging and breeding habitat is known to be associated with the soil landscapes of Land Zone 5 (well drained sandy or loamy soils on undulating plains and foothills) and Land Zone 7 (lateritic soils on low jump-ups and escarpments) (Department of Agriculture Water and the Environment, 2020b). Breeding habitat is within 1 km of suitable waterbodies, whereas foraging can occur up to 3 km from such waterbodies. Waterbodies that are suitable for the species occur on the lower, gentle slopes and plateaus of sandstone ranges (equivalent to Land Zone 10), alluvial clay soils on river or creek flats (represented by Land Zone 3) or non-alluvial clay soils on flats or plains which are not associated with current alluvial deposits (represented by Land Zone 4). Where natural foraging or breeding habitat occurs (i.e. on Land Zones 5 and 7), the Squatter Pigeon (southern) (*Geophaps scripta scripta*) may be found in vegetation types growing on the above soil types (Squatter Pigeon Workshop, 2011). Dispersal habitat for this species is any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies.

The Squatter Pigeon (Southern) (*Geophaps scripta scripta*) was recorded in the Project Site by SKM (2012) and AECOM (2017). Essential Habitat for the species has also been mapped in the Project Site. This species is expected to occur throughout the Project Site, with preferred, suitable and marginal habitat identified.

Based on BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell, et. al., 2020), the extent of potential habitat for the species is summarised in Table 28 and displayed in Figure 17.

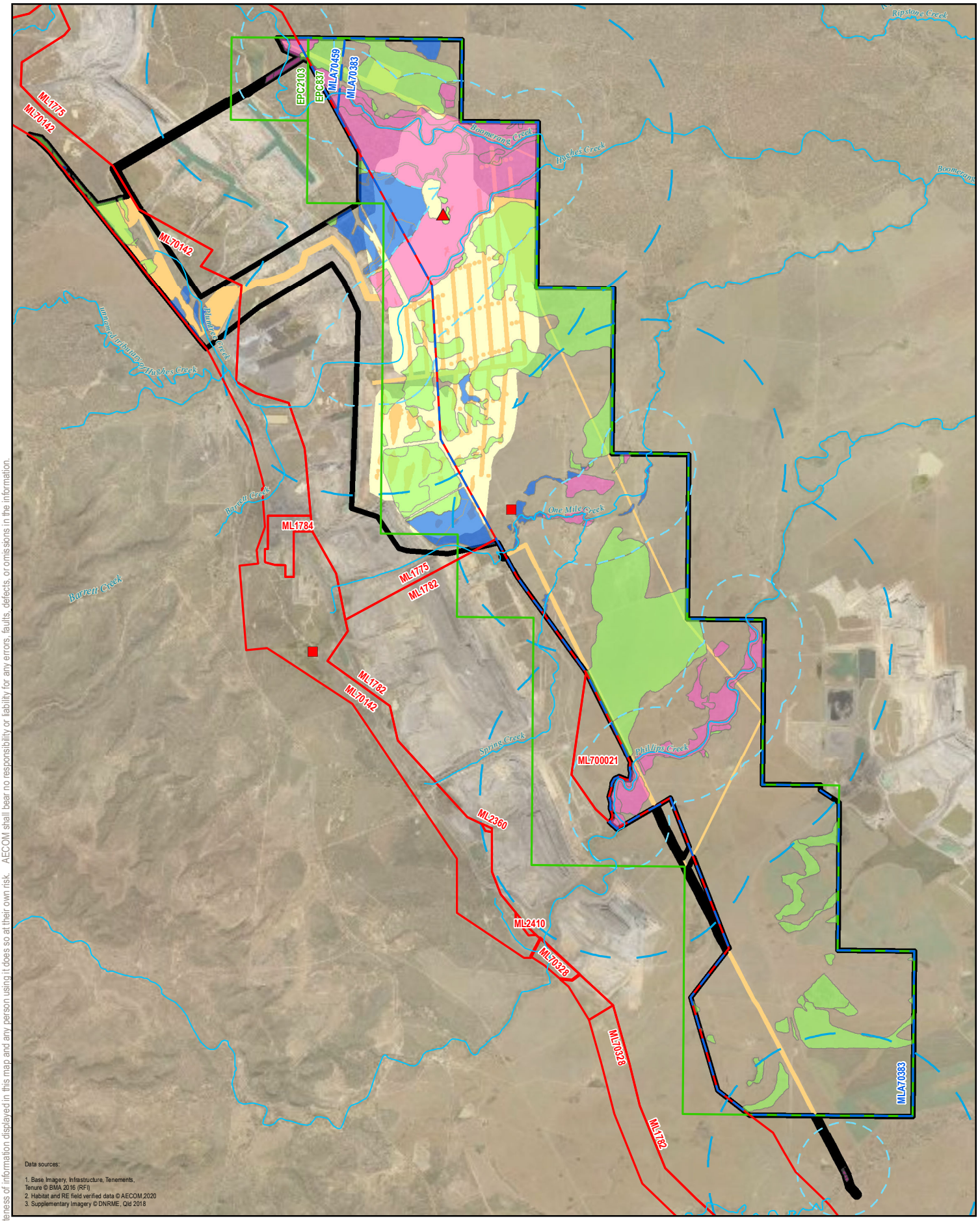
Table 28 Potential habitat for Squatter Pigeon (*Geophaps scripta scripta*)

Habitat definition	Potential habitat type	Total area (ha) within the Project Site	Area (ha) within Project Footprint
• Remnant or regrowth grassy open forest to woodland dominated by *Eucalyptus*, *Corymbia*, *Callitris* or *Acacia* with patchy, relatively sparse ground cover vegetation (33per cent) and sparse shrub layer on well-draining sandy, loamy or gravelly soils within 1 km of a suitable permanent waterbody. • Preferred habitat may be located on land zones 3, 5, 7, 8, 9 and 10. • Preferred habitat does not include areas dominated by introduced pasture grasses, in particular *Cenchrus ciliaris*, nor heavily grazed areas but these areas may be included in suitable and marginal habitat as defined below.	Preferred	1,375.27	631.24
• Remnant or regrowth grassy open forest to woodland dominated by *Eucalyptus*, *Corymbia*, *Callitris* or *Acacia* with patchy, relatively sparse ground cover vegetation (<33 per cent) on well-draining sandy, loamy or gravelly soils between 1 and 3 km of a suitable permanent or seasonal waterbody2; and • Non-remnant areas within 100 m of preferred habitat. • Suitable habitat may be located on land zones 3, 5, 7, 8, 9 and 10.	Suitable	475.80	289.87

Habitat definition	Potential habitat type	Total area (ha) within the Project Site	Area (ha) within Project Footprint
• Non-remnant areas, regrowth and remnant woodland or forest areas more than 3 km from a permanent or seasonal waterbody that facilities the movement of the species between patches of preferred or suitable habitat.	Marginal	2,524.20	941.22
Total		**4,375.27**	**1,862.33**

[1] Includes mapped wetlands and ≥3rd order streams

[2] Includes 1st and 2nd order streams.



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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- 1km buffer of watercourse
- 3km buffer of watercourse
- Watercourse

Threatened Fauna Location

- Squatter Pigeon (AECOM 2017)
- Squatter Pigeon (SKM 2012)

Potential habitat

- Squatter Pigeon preferred habitat
- Squatter Pigeon suitable habitat
- Squatter Pigeon marginal habitat

N

Figure 17

Squatter Pigeon potential habitat within Project Site

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Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Greater Glider (*Petauroides volans*)

The Greater Glider (*Petauroides volans*) was listed as Vulnerable under the EPBC Act and NC Act at the time of the submission of the Project EPBC Act referral.

The Greater Glider (*Petauroides volans*) is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest). This species is largely restricted to eucalypt forests and woodlands. During the day, they spend most of their time denning in hollowed trees, with each animal inhabiting up to twenty different dens within its home range. It is primarily folivorous, with a diet mostly comprising the leaves and flowers of Myrtaceae (e.g. eucalypt) trees. Home ranges of this species are typically relatively small (1 – 4 ha) but are larger in lower productivity forests and more open woodlands (up to 16 ha) (Threatened Species Scientific Committee, 2016).

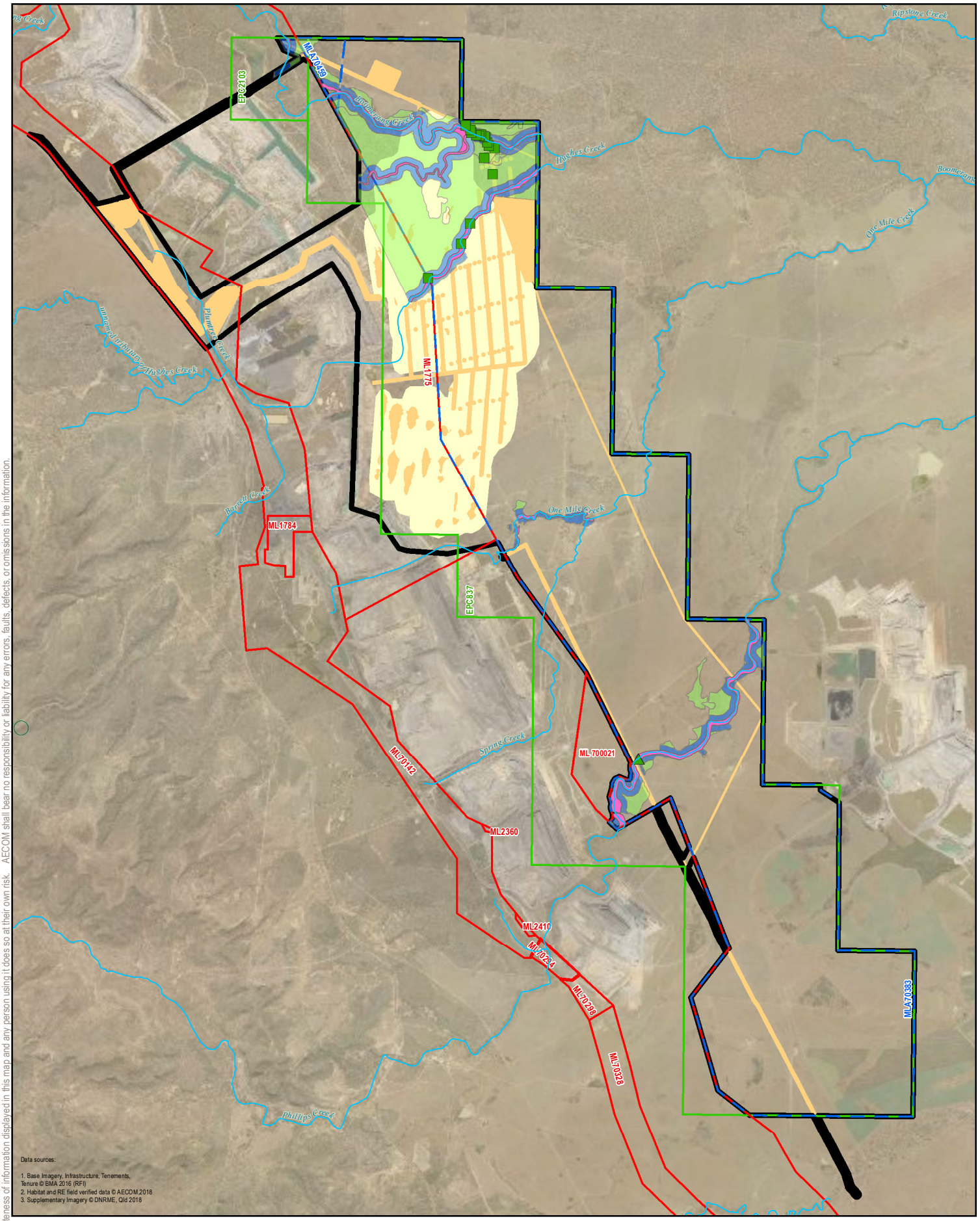
One Greater Glider (*Petauroides volans*) was located in mature *Eucalyptus camaldulensis* (River Red Gum) woodlands fringing Phillips Creek in the south of the Project Site by SKM (2012). Within similar habitat associated with Boomerang Creek and Hughes Creek in the north of the Project Site, another 18 Greater Gliders (*Petauroides volans*) were observed by AECOM in 2020 and one additional individual was also found in *Eucalyptus* and/or *Corymbia* open woodland (RE 11.5.3). Several records are available from Atlas of Living Australia approximately 10 km west of the Project Site.

Based on BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell, et. al., 2020), the extent of potential habitat for the species is summarised in Table 29 and displayed in Figure 18.

Table 29 Potential habitat for Greater Glider (*Petauroides volans*)

Habitat definition	Potential habitat type	Total area (ha) within the Project Site	Area (ha) within Project Footprint
• Remnant, connected eucalypt woodlands containing more than 2 hollow bearing trees/ha, with hollows medium-large in size (>10 cm entrance). • In Central Queensland, preferred foraging and den trees include *E. camaldulensis*, *E. tereticornis*, *E. fibrosa* and *Corymbia citriodora*. The species has also been observed in *Angophora floribunda*, *Eucalyptus cambageana*, *E. coolabah*, *E. crebra*, *E. laevopinea*, *E. moluccana*, *E. orgadophila*, *E. populnea*, *E. melanophloia* and *C. tessellaris* in which it may use for foraging and/or denning.	Preferred	190.05	72.28
• Remnant eucalypt woodlands connected to areas of roosting habitat that does not contain more than 2 hollow bearing trees/ha, medium-large in size (>10 cm entrance). Home range of the species estimated at 120 m of breeding / denning habitat.	Suitable	441.82	195.22
• Remnant or high value regrowth vegetation[1] adjacent to preferred greater glider habitat where hollows are smaller and/or less frequent. Isolated patches of marginal habitat >100 m from adjacent habitat do not provide habitat for the species due to gliding capabilities.	Marginal	848.95	480.63
Total		**1,480.81**	**748.13**

[1] For high value regrowth to be considered marginal habitat, it needs to include scattered large Eucalypt trees as Smith *et al.* (2007) did not observe any gliders foraging in non-myrtaceous species or myrtaceous trees <20 cm dbh.



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Threatened fauna location

- Greater Glider (AECOM 2020)
- Greater Glider (SKM 2012)
- Greater Glider (DES and ALA 2023)

Potential habitat

- Greater Glider preferred habitat
- Greater Glider suitable habitat
- Greater Glider marginal habitat

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Figure 18

Greater Glider potential habitat within the Project Site

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0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

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Koala (*Phascolarctos cinereus*)

Koala (*Phascolarctos cinereus*) was listed as Vulnerable under the EPBC Act and NC Act at the time of the submission of the Project EPBC Act referral.

Koalas (*Phascolarctos cinereus*) inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by species from the genus *Eucalyptus* (Martin & Handasyde, 1999). With relation to the combined populations of Queensland, New South Wales and the Australian Capital Territory, the range of this species extends from approximately the latitude of Cairns to the New South Wales-Victoria border. The distribution of Koalas (*Phascolarctos cinereus*) is also affected by altitude (limited to less than 800 m ASL), temperature and at the western and northern ends of the range, leaf moisture (Munks, Corkrey, & Foley, 1996).

The Koala (*Phascolarctos cinereus*) is heavily reliant on eucalypt leaves, a diet that is extremely energy constraining. As a result, the Koala (*Phascolarctos cinereus*) is very inactive and spends around 19 hours per day sleeping (Curtis & Dennis, 2012). As per the *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory* (DAWE, 2022), food trees are those from the following genus: *Angophora, Corymbia, Eucalyptus, Lophostemon* and *Melaleuca*. 'Primary' food and 'secondary' Koala (*Phascolarctos cinereus*) food trees are also defined by the Australian Koala Foundation (Mitchell, 2015), however it should be noted that these categories are not relevant to EPBC Act assessments.

A solitary Koala (*Phascolarctos cinereus*) was observed in the north-western extent of the Project Site within the riparian zone associated with Plumtree Creek by AECOM (2020) and one Koala (*Phascolarctos cinereus*) was recorded from Downs Creek adjacent to the Project Site during previous ecological surveys. An additional record exists from ALA approximately 4 km west of the Project Site and the species was recorded at Peak Downs Mine East, directly north of the Project Site by AECOM in 2018.

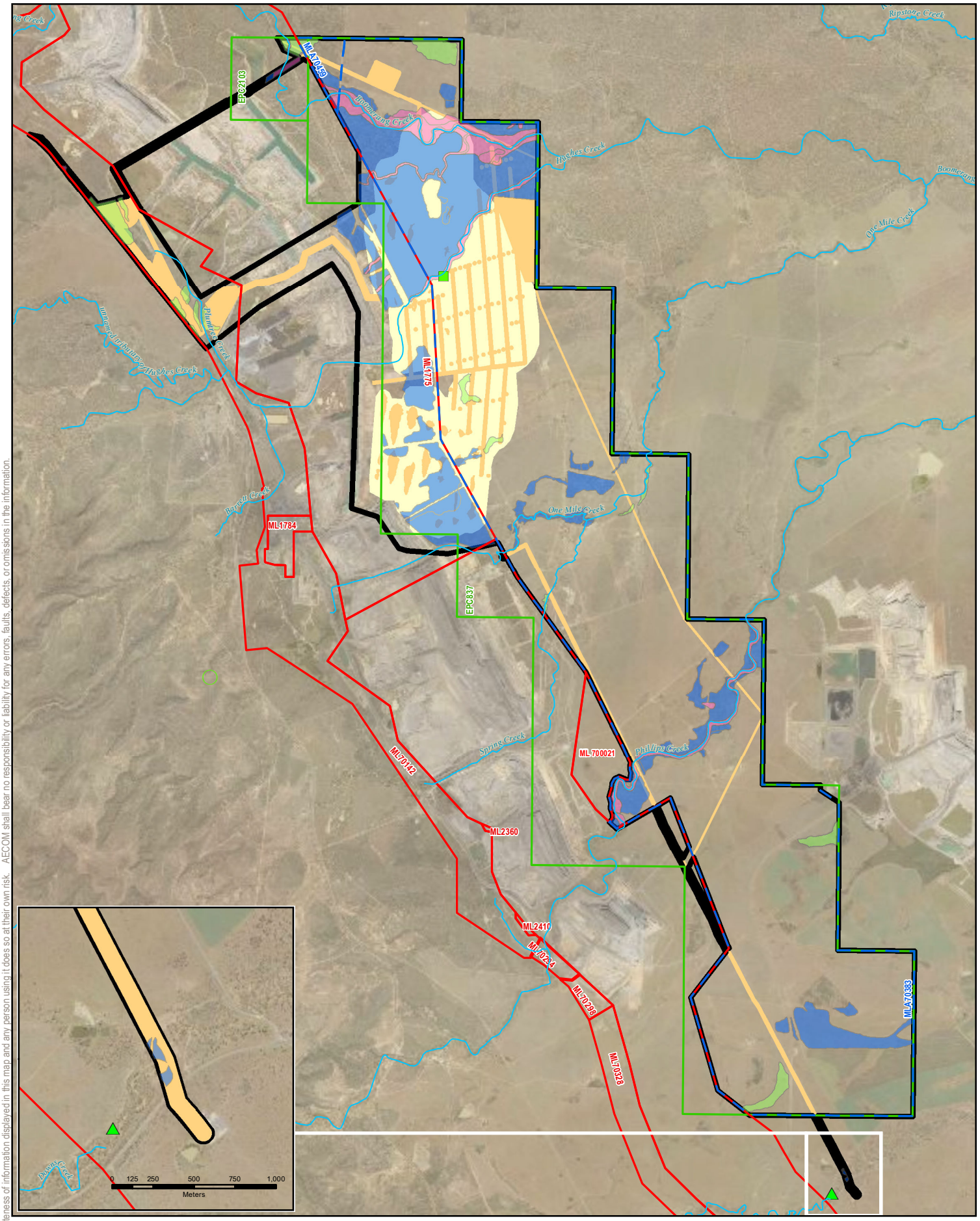
Based on BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell, et. al., 2020), the extent of potential habitat for the species is summarised in Table 30 and displayed on Figure 19.

Table 30 Potential habitat for Koala (*Phascolarctos cinereus*)

Habitat definition	Potential habitat type	Total area (ha) within the Project Site	Area (ha) within Project Footprint
• Contiguous remnant eucalyptus open forest to woodlands near a permanent or ephemeral water source, and • Where primary or secondary food trees are dominant in the canopy. Primary food trees across the entire Central Queensland region include *Eucalyptus camaldulensis* and *E. tereticornis*.	Preferred	362.03	140.93
• Remnant and regrowth eucalyptus open forest to woodlands where primary or secondary food trees are present (but not necessarily dominant) in the canopy and that have connectivity to other areas of suitable or preferred habitat.	Suitable	1,748.51	930.17
• All other fragmented and sparsely distributed woodlands and open woodlands, shrub lands and forests in modified agricultural-grazing landscapes that may provide food resources or aids to movement.	Marginal	386.67	89.07
Total		**2,497.21**	**1,160.17**

[1] Permanent and ephemeral water may originate from a variety of sources e.g. groundwater aquifers, nearby wetlands/watercourses, rainfall seepage/runoff. In central Queensland, it is known that riparian vegetation is highly utilised.

[2] Primary food and secondary food trees vary on the location within Central Queensland. Refer to https://www.savethekoala.com/sites/savethekoala.com/files/uploads/20150212_AKF_National_Koala_Tree_Planting_List.pdf for guidance



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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Threatened fauna location

- Koala (URS 2014)
- Koala (AECOM 2020)
- Koala (ALA and DES 2023)

Potential habitat

- Koala preferred habitat
- Koala suitable habitat
- Koala marginal habitat

N

Figure 19

Koala potential habitat within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Grey Falcon (*Falco hypoleucos*)

The Grey Falcon (*Falco hypoleucos*) is listed as vulnerable under the NC Act. The species was not listed under the EPBC Act at the time of the submission of the Project EPBC Act referral.

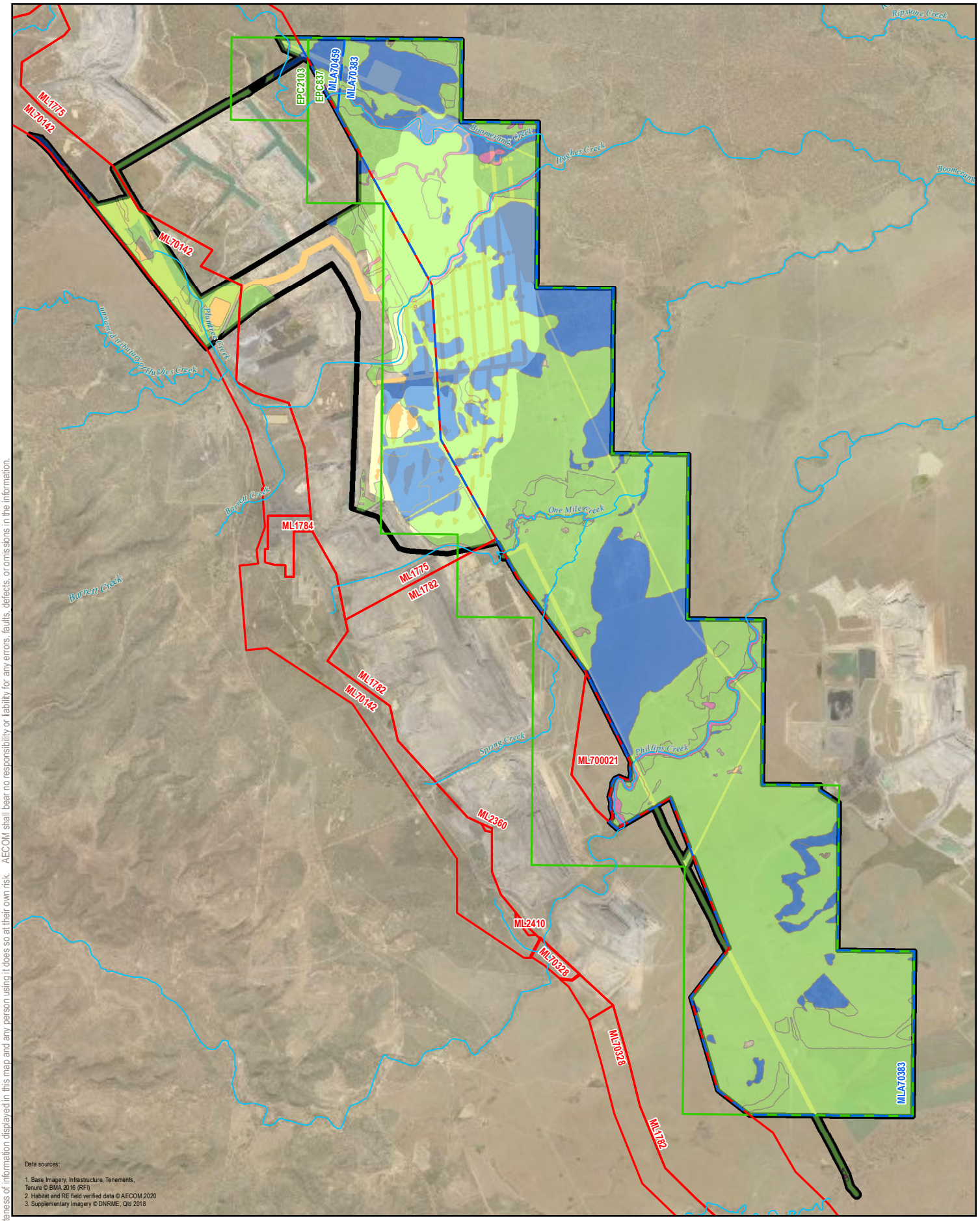
The Grey Falcon (*Falco hypoleucos*) is endemic to mainland Australia, occurring across the arid and semi-arid regions including the Murray-Darling Basin, Eyre Basin, central Australia and western Australia (Threatened Species Scientific Committee, 2020). It is largely restricted to areas of high annual average temperatures and average annual rainfall of less than 500 mm. It has been recorded in timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined watercourses. They have also been observed foraging in treeless areas and in tussock grassland and open woodland, especially in winter.

Breeding occurs from June to November, with eggs generally being laid in the old nests of other birds, namely those of other raptors or corvids. It is reported that nests in the tallest trees, especially *Eucalyptus camaldulensis* (River Red Gum) and *Eucalyptus coolabah* (Coolabah) along watercourses are preferred (Threatened Species Scientific Committee, 2020). However, like other falcons this species may also nest in telecommunication towers. There are no known breeding pairs. The home range of the species is undetermined; however, is likely to be larger than similar species (i.e. peregrine falcon), over 100 km^2 in size (NSW Scientific Committee, 2009).

This species was not confirmed within the Project Site during any of the field surveys. However, in 2005 EcoServe recorded the species on the adjacent Saraji Mine and as such this species is considered likely to occur. Due to the broad definition of suitable habitat for this species, all vegetation within the Project Site is considered to provide some value for the lifecycle requirements of the Grey Falcon (*Falco hypoleucos*). The extent of potential habitat for the species is summarised in Table 31 and displayed in Figure 20.

Table 31 Potential habitat for Grey Falcon (Falco hypoleucos)

Habitat definition	Potential habitat type	Total area (ha) within the Project Site	Area (ha) within the Project Footprint
• Remnant vegetation that is dominated by *Eucalyptus* sp. In the canopy and associated with a water source (i.e. watercourses or wetlands) (breeding and foraging).	Preferred	208.72	76.48
• Remnant or regrowth vegetation that contains *Acacia* spp. (foraging)	Suitable	2,453.78	961.70
• All other vegetation that does not contain *Acacia* spp., including regrowth and non-remnant areas	Marginal	7,979.29	2,075.39
	Total	**10,641.79**	**3,113.57**



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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Potential habitat

- Grey Falcon preferred habitat
- Grey Falcon marginal habitat
- Grey Falcon suitable habitat

Figure 20

Grey Falcon potential habitat within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

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Short-beaked Echidna (*Tachyglossus aculeatus*)

The Short-beaked Echidna (*Tachyglossus aculeatus*) is listed as Special Least Concern under the NC Act, due to its special cultural significance.

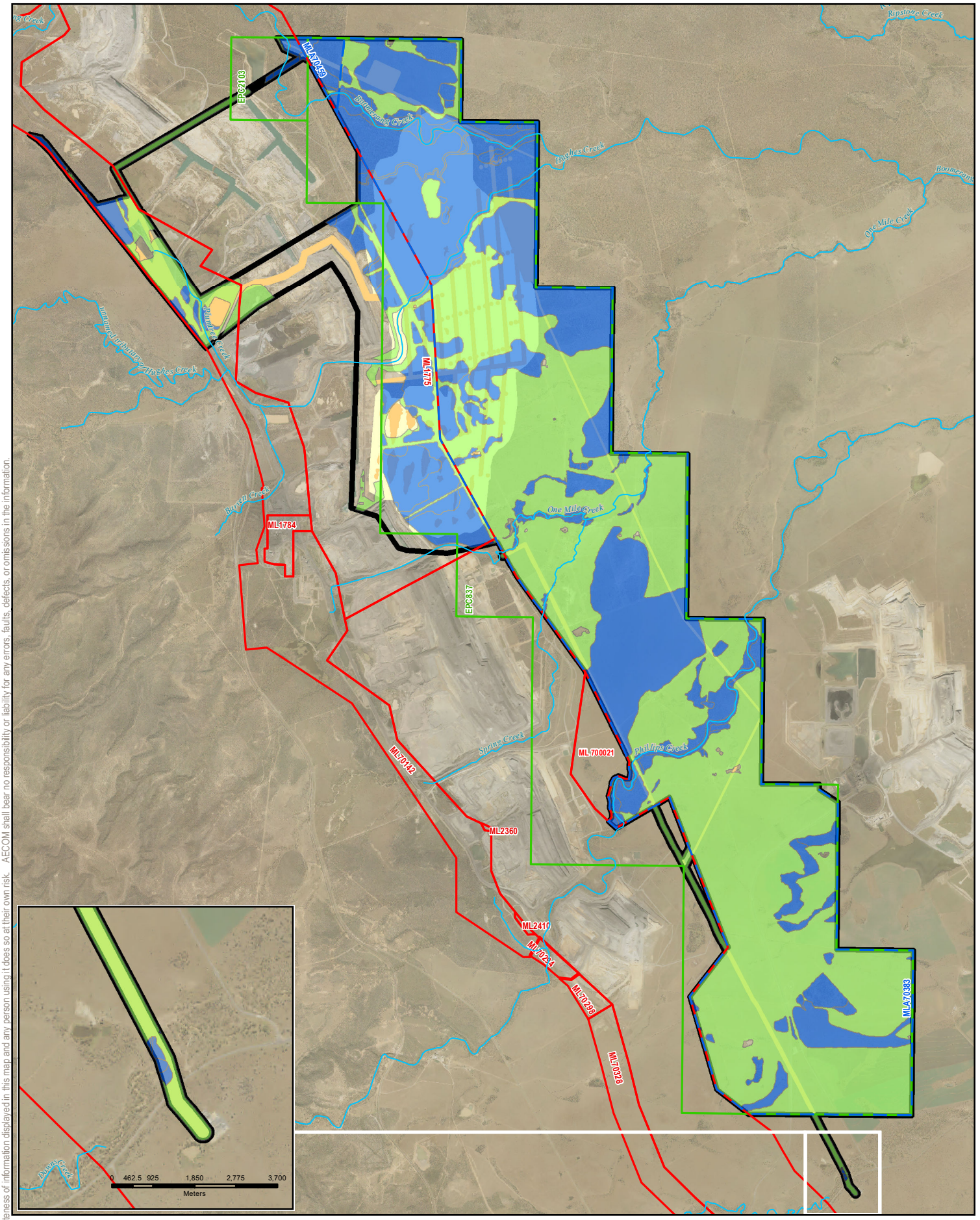
The Short-beaked Echidna (*Tachyglossus aculeatus*) is found throughout Australia, including Tasmania. It is Australia's most widespread native animal (The Australian Museum, 2018). No systematic study of the ecology of the Short-beaked Echidna (*Tachyglossus aculeatus*) has been published, but studies of several aspects of their behaviour have been conducted. Individuals are solitary, wanderers: they have large, overlapping home ranges (up to 50 ha) and only maintain a fixed shelter or nest site when rearing their young in a burrow (Augee, Gooden, & Musser, 2006). They avoid extremes in temperature by sheltering in hollow logs, rock crevices and vegetation. Limited only by an insufficient supply of ants or termites, Short-beaked Echidnas (*Tachyglossus aculeatus*) live in a range of climates and habitats.

The Short-beaked Echidna (*Tachyglossus aculeatus*) has been confirmed within the Project Site. Given the very broad utilisation of habitat by this species, all vegetation within the Project Site is considered to provide potential habitat.

The extent of potential habitat for Short-beaked Echidna (*Tachyglossus aculeatus*) is summarised in Table 32 and displayed in Figure 21. No records of the Short-beaked Echidna were found within the map extent according to DES and ALA 2023.

Table 32 Potential habitat for Short-beaked Echidna (Tachyglossus aculeatus)

Habitat definition	Potential habitat type	Total area (ha) within the Project Site	Area (ha) within the Project Footprint
• All remnant and regrowth vegetation that contains variety of sheltering opportunities present.	Suitable	4,389.38	1,854.87
• Non-remnant vegetation; area's where sheltering opportunities are largely restricted to grass cover.	Marginal	6,252.41	1,258.70
	Total	**10,641.79**	**3,113.57**



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Potential habitat

- Short-beaked Echidna marginal habitat
- Short-beaked Echidna suitable habitat

N

Figure 21
Short-beaked Echidna potential habitat within the Project Site
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)
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5.2.3.2 Migratory fauna

The literature review and desktop searches identified fourteen migratory species as potentially occurring in the survey area (Section 4.1.3). Four of these species have been previously recorded by EcoServe in 2005 during surveys of Saraji Mine. These species included Fork-tailed Swift (*Apus pacificus*), Latham's Snipe (*Gallinago hardwickii*), White-throated Needletail (*Hirundapus caudacutus*) and Caspian Tern (*Hydroprogne caspia*).

Fork-tailed Swift (*Apus pacificus*) primarily occurs over inland plains but is known to utilise diverse habitat from coastal foothills, cliffs, beaches, urban areas, riparian woodland, heathland, treeless grassland, spinifex covered sandplains, open farmland, dunes, low scrub, heathland, saltmarsh and tea-tree swamps (DoEE, 2016). The species is found across northern Australia and may use the airspace above wooded areas and open plains within Project Site. They are almost exclusively aerial and do not breed in Australia.

Latham's Snipe (*Gallinago hardwickii*) uses a variety of freshwater or brackish wetlands, preferring to be close to protective vegetation cover. Small patches of suitable habitat are available within the Project Site in wetlands in the northeast of the Project Site and ponds to the east of Saraji Mine.

The White-throated Needletail (*Hirundapus caudacutus*) is almost exclusively aerial and is known to occur over a variety of habitats. Foraging habitat is at heights of up to cloud level over a variety of habitats. The species may be found in the airspace above all areas within the Project Site.

A pair of Caspian Terns (*Hydroprogne caspia*) were observed foraging over the evaporation dam on the eastern side of Saraji Mine during SKM surveys in 2007. Suitable habitat for this species within the Project Site includes dams and wetlands.

5.2.4 Pest animals

Nine introduced vertebrate fauna species were recorded within the Project Site, of which eight are mammals and one an amphibian. This included five species which are considered to be 'Restricted Matter' under the *Biosecurity Act 2014* and three species noted within the *Isaac Region Biosecurity Plan 2020-2023*. These are listed in Table 33. All of these species are commonly encountered in central Queensland.

The survey area is used for grazing domesticated cattle (*Bos taurus**). All other introduced species noted are present as true pest animals. European Rabbit (*Oryctolagus cuniculus**) is abundant throughout the site, as are Cane Toads (*Bufo marinus**). Feral Cats (*Felis catus**) were observed, whilst Wild Dogs (*Canis lupus dingo/familiaris**) were recorded by SKM in 2007. Signs of Feral Pigs (*Sus scrofa**) were common throughout the Project Site, especially as wallows in creek beds and dam verges, while a herd of up to 20 animals was recorded moving through natural grasslands south of Phillips Creek in August 2016. House Mouse (*Mus musculus**) was trapped in grasslands by SKM in 2007 and are likely to be widespread over the Project Site. Foxes (*Vulpes vulpes**) were observed during nocturnal surveys and by analysing scats found in *Eucalyptus populnea* (Poplar Box) open woodland.

No other Biosecurity Act-listed pest fauna species were identified in the literature review or desktop assessment as previously recorded in proximity to the Project Site.

Table 33 Pest animals identified within the Project Site

Scientific Name	Common Name	Biosecurity Matter[1]	Isaac Region Biosecurity Plan – Priority Pests	Source[2]
*Bos taurus**	Cattle	-	-	AECOM, SKM, ES, WL
*Canis lupus dingo/ familiaris**	Wild Dog	Restricted Matter (Category: 3, 4, 5, 6)	Yes	ES
*Felis catus**	Feral Cat	Restricted Matter (Category: 3, 4, 6)	Yes	ES
*Lepus europaeus**	European Hare	-	-	ES
*Mus musculus**	House Mouse	-	-	ES
*Oryctolagus cuniculus**	European Rabbit	Restricted Matter (Category: 3, 4, 5, 6)	-	AECOM, ES
*Bufo marinus**	Cane Toad	-	-	AECOM, SKM, ES, WL
*Sus scrofa**	Pig	Restricted Matter (Category: 3, 4, 6)	Yes	AECOM, ES
*Vulpes Vulpes**	Fox	Restricted Matter (Category: 3, 4, 5, 6)	-	AECOM

[1] Biosecurity matter refer to matters which are listed under the *Biosecurity Act 2014*. 'Prohibited' matters are biosecurity matter that are not currently present in Queensland, but would have a significant adverse social, economic, health or environment impact on if it entered the state. 'Restricted matter' refer to biosecurity matter found in Queensland which have a significant impact on social, economic, health or environmental issues.

[2] Source: AECOM, SKM (Field Surveys), ES (EcoServe 2005), WL (Wildlife Online).

6.0 Environmentally sensitive areas

6.1 Introduction

This section of the report describes the ESAs present within the Project Site and surrounding region. ESAs include national parks, State forests, world heritage areas, Ramsar wetlands and nationally important wetlands. In addition, they feature areas of elevated natural and cultural value such as habitat for conservation significant flora and fauna and places of Aboriginal and European cultural heritage.

6.2 Approach

Accessible, current and reliable data sources were used to prepare this section. Datasets provided by DES were obtained to determine the location of ESAs in relation to the Project Site. A 100 km search radius from the Project Site was used to identify any ESAs in the surrounding region. As impacts on REs outside the Project Site are unlikely, and State RE mapping can be relatively coarse, REs were excluded from searches outside the Project Site. ESAs within the search area were identified and the potential impacts that the Project may have on those ESAs were determined. It is considered that any ESAs outside the 100 km radius are unlikely to be impacted by the Project. However, due to the dynamic nature of waterways and aquatic habitats, the potential for impact on ESAs such as wetlands and fish habitats lying downstream of the proposed mine development beyond the 100 km radius was determined. The level of protection applied to each ESA as declared under current legislation is discussed in Section 6.3.

6.3 Description of environmentally sensitive areas

6.3.1 Category A ESAs

Category A ESAs, as defined by the EP Regulation, are displayed in Table 34. The occurrence of these areas in relation to the Project Site is described below. In Queensland, mining activities may not be undertaken in land comprising Category A ESAs.

Table 34 Category A ESAs and Administering Legislation

Category A Protected Areas	Administering Legislation
National Park National Park (Scientific) National Park (Aboriginal land) National Park (Torres Strait Islander land) National Park (Cape York Peninsula Aboriginal Land) National Park (Recovery)	NC Act
Conservation Park	NC Act
Forest Reserve	NC Act
Wet Tropics World Heritage Area	*Wet Tropics World Heritage Protection and Management Act 1993*
Great Barrier Reef Region	*Great Barrier Reef Marine Park Act 1975* (Commonwealth)
Marine Parks (other than general use zones)	*Marine Parks Act 2004*

Geographic information system (GIS) interpretation was undertaken to determine if Category A ESAs exist within or in close proximity to the Project Site. The results of this interpretation are discussed below. There are no Category A ESAs in the Project Site (Figure 22).

National Parks

National Parks are declared under the NC Act and defined as Category A protected areas (Table 34). There are no National Parks within the Project Site however there are four that occur within a 100 km radius of the Project Site (refer to Figure 22):

- Homevale National Park
- Junee National Park
- Mazeppa National Park
- Peak Range National Park.

Forest reserves and conservation parks

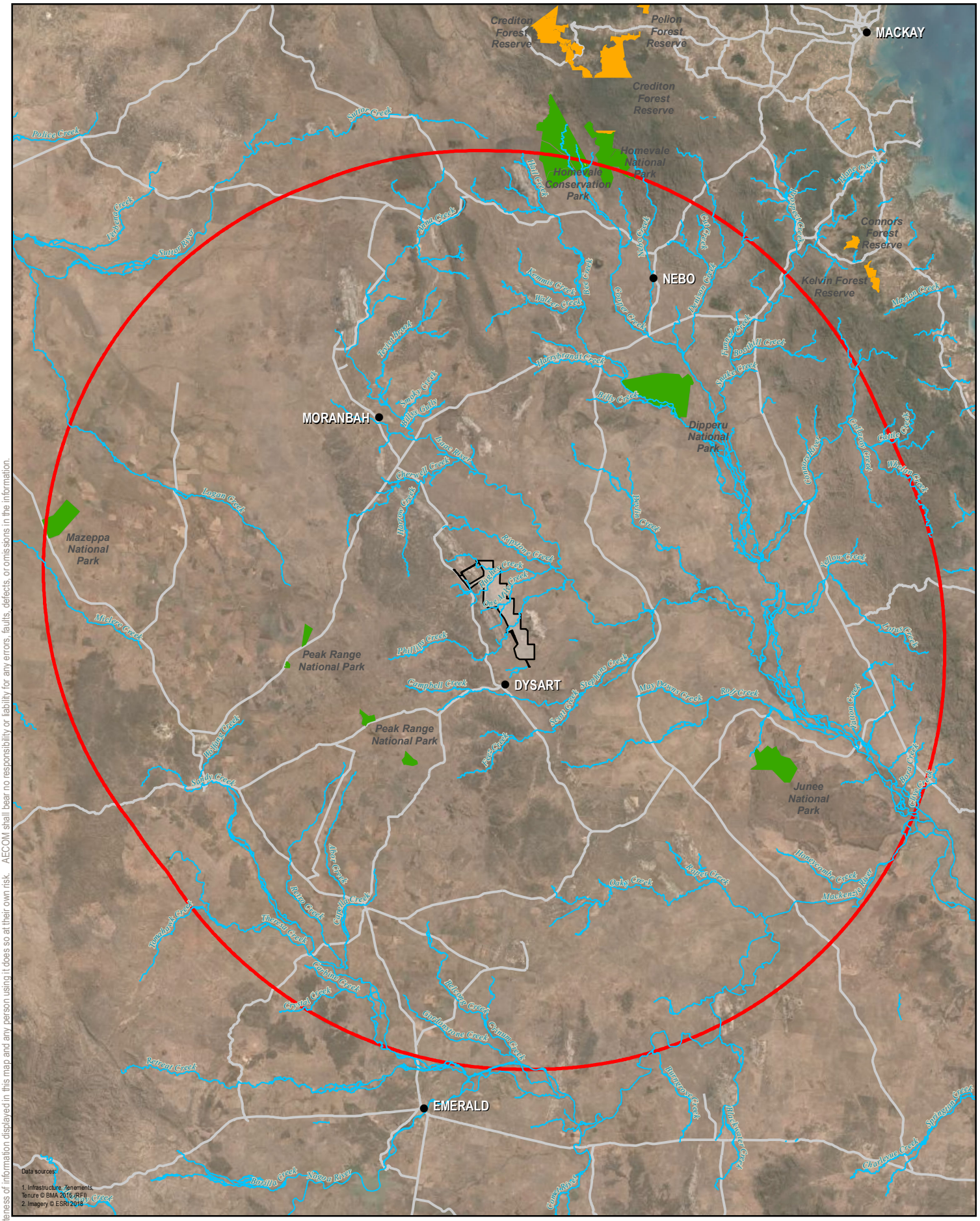
Conservation parks, as listed under the Nature Conservation (Protected Areas) Regulation 1994 and forest reserves are protected areas under the NC Act. The Homevale Conservation Park is situated approximately 95 km north east of the Project Site (Figure 22).

Wet Tropics World Heritage Area

The Wet Tropics World Heritage Area is declared under the *Wet Tropics World Heritage Protection and Management Act 1993* and is administered by the Wet Tropics Management Authority. The Wet Tropics World Heritage Area is located approximately 400 km north-east of the Project Site.

Great Barrier Reef Marine Park and other marine parks (other than general use zones)

The GBRMP is declared under the *Great Barrier Reef Marine Park Act 1975*. The Project is situated approximately 130 km directly west of the GBRMP. However, the Project is situated within the Fitzroy Catchment which discharges into the GBRMP, approximately 490 km downstream of the Project Site. The potential impacts on downstream ESAs are discussed in Section 9.2.



LEGEND

- Locality
- Project Site
- 100km Project Area radius
- Major Road
- Watercourse

Category A ESA

- National Park
- Conservation Park
- Forest Reserve

N

Figure 22
Category A Environmentally Sensitive Areas
Environmental Impact Statement
Saraji East Mining Lease Project

0 5 10 20
Kilometres

Scale: 1:1,200,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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6.3.2 Category B ESAs

Category B ESAs are defined in the EP Regulation, and are presented in Table 35. The occurrence of these areas in relation to the Project Site is described below. In Queensland, mining activities can be undertaken in land comprising Category B ESAs, if they are authorised under the EA.

Table 35 Category B ESAs and Administering Legislation

Category B Protected Areas	Administering Legislation
Endangered Regional Ecosystems (Biodiversity Status)	VM Act
Coordinated Conservation Areas	NC Act
Critical Habitat Areas	NC Act
Areas of Interim Conservation Order	NC Act
Ramsar Wetlands	Ramsar Convention
World Heritage Areas	NC Act
International Agreement Areas	International Conventions
Marine Parks	*Marine Parks Act 2004*
Queensland Heritage Registered Places	*Queensland Heritage Act 2004*
Aboriginal Cultural Heritage Areas Torres Strait Islander Cultural Heritage Areas	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*
Special Forestry Areas – feature protection areas, State forest park or scientific area	*Forestry Act 1959*
Fish Habitat Areas	*Fisheries Act 1994*
Marine Plants	*Fisheries Act 1994*
An Area to the Seaward Side of the Highest Astronomical Tide	Nil

GIS interpretation was undertaken to determine if the above ESAs are situated within or in close proximity to the Project Site. The results of this interpretation are discussed below.

Endangered regional ecosystems

REs listed as endangered (biodiversity status) are Category B protected ESAs. Three State-mapped EREs occur within the Project Site as listed in Table 36.

Table 36 Endangered Regional Ecosystems

RE	Short Description
11.3.1	*Acacia harpophylla* open woodland on alluvial plains
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains
11.4.9	*Acacia harpophylla* shrubby open forest to woodland; *Terminalia oblongata* on Cainozoic clay plains

Field surveys confirmed these three EREs during field surveys of the Project Site (refer to Section 4.2.1). The locality of these EREs is depicted in Figure 23. No additional EREs were identified during field surveys.

Coordinated conservation areas and wilderness areas

Coordinated conservation areas and wilderness areas as declared under the NC Act are Category B protected areas. There are no coordinated conservation areas or wilderness areas within the Project Site or the greater region.

Ramsar wetlands

The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Ramsar wetlands are those that are representative, rare or unique wetlands, or are important for conserving biological diversity (DoE, 2016). There are no wetlands declared under the Ramsar Convention within the Project Site. The nearest Ramsar wetland (Shoalwater and Corio bays) is approximately 220 km south-east of the Project Site. The Shoalwater and Corio bays occur within a separate catchment (Shoalwater and Waterpark Basin) to the Project.

World heritage and international agreement areas

World heritage is the designation for places on earth that are of outstanding universal value to humanity and, as such, have been inscribed on the World Heritage List (UNESCO 2011). International agreement areas include areas such as internationally significant sites for migratory shorebirds. As detailed above, the Project occurs within the Fitzroy Basin which discharges into the Great Barrier Reef World Heritage Area (GBRWHA), approximately 490 km adopted middle thread distance downstream of the Project Site.

General use zones of a marine park

General use zones of a marine park are declared under the *Marine Parks Act 2004*. As stated above, the Project occurs within the Fitzroy Basin which discharges into the GBRWHA. The GBRWHA borders a general use zone of the GBRMP.

Places of cultural heritage significance and areas recorded in the Aboriginal and Torres Strait Islander cultural heritage register

Places of cultural heritage significance are protected by the *Queensland Heritage Act 1992*, and listed on the heritage register. Aboriginal and Torres Strait Islander cultural heritage is protected under the *Aboriginal Cultural Heritage Act 2003* (ACH Act) and the *Torres Strait Islander Cultural Heritage Act 2003*. These areas are listed on the Aboriginal and Torres Strait Islander Cultural Heritage Register.

Refer to **Chapter 16 Cultural Heritage** (BMA, 2023) of this EIS for a discussion on cultural heritage values within and surrounding the Project Site.

Special forestry areas

Special forestry areas, including State plantation forests, State forests (scientific) and State parks, are declared under the *Forestry Act 1959*, and are administered by DES. There are no special forestry areas within the Project Site or the surrounding area.

Fish habitat area and marine plants

A declared fish habitat area (FHA) is an area protected against physical disturbance from coastal development (DAFF, 2012). No declared fish habitat areas are situated within 100 km of the Project Site. The Fitzroy River FHA extends along the Fitzroy River from the Fitzroy Barrage at Rockhampton to the coast, however this FHA is considered sufficiently far enough downstream to not be affected by the proposed project.

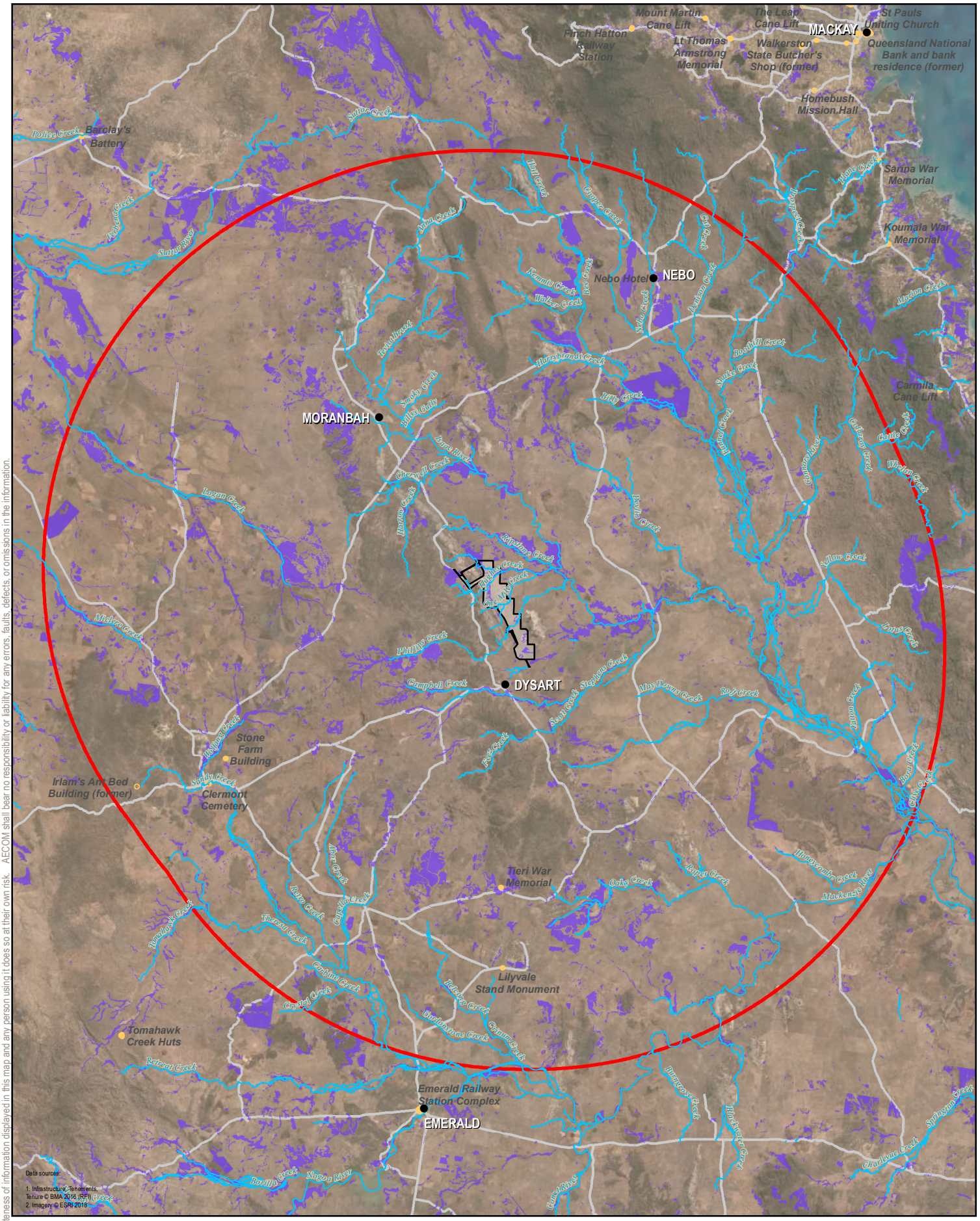
All marine plants are protected under Queensland law through provisions of the *Fisheries Act 1994*. There are no marine plants within a 100 km radius of the Project Site.

Critical habitat

Critical habitat is habitat that is essential for the conservation of a viable population of protected wildlife or community of native wildlife, whether or not special management considerations and protection are required. A critical habitat may include an area of land that is considered essential for the conservation of protected wildlife, even though the area is not presently occupied by the wildlife (NC Act). There are no declared critical habitats within or surrounding the Project Site.

An area to the seaward side of the highest astronomical tide

Areas that face the seaward side of the highest astronomical tide are a Category B protected areas. No areas within the Project Site meet this criterion.



LEGEND

- Locality
- Project Site
- 100km Project Area radius
- Major Road
- Watercourse

Category B ESA

- Endangered Regional Ecosystem (Biodiversity Status)
- Queensland Heritage Register Place

N

Figure 23
Category B Environmentally Sensitive Areas

Saraji East Mining Lease Project

0 5 10 20
Kilometres

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6.3.3 Category C ESAs

Category C ESAs are defined in DEHP's Code of Environmental Compliance for Exploration and Mineral Development Projects – Version 1.1[2] (Table 37). The occurrence of these areas in relation to the Project Site is further described below. In Queensland, mining activities can be undertaken in Category C ESAs.

Table 37 Category C ESAs and Administering Legislation

Category C Protected Areas	Administering Legislation
Nature Refuges and Resource Reserves	NC Act
Declared Catchment Areas; Declared Irrigation and Irrigation Project Areas; and Water Reservoirs and Drainage Areas	*Water Act 2000*
River Improvement Areas	*River Improvement Trust Act 1940*
Stanbroke Designated Landscape Area	ACH Act
State Forests or Timber Reserves	*Forestry Act 1959*
Coastal Management Districts	*Coastal Protection and Management Act 1995*
Erosion Prone Areas and Coastal Management Control Districts	*Beach Protection Act 1968*
Dams and Weirs	Nil

GIS interpretation was undertaken to determine if the above ESAs are situated within or in close proximity to the Project Site. The results of this interpretation are described below and illustrated in Figure 24.

Nature refuges and resource reserves

A nature refuge is a voluntary agreement between a landholder and the Queensland Government that acknowledges a commitment to manage and preserve land with significant conservation values while allowing compatible and sustainable land uses to continue (DEHP, 2017b).

There are no nature refuges or resource reserves within the Project Site. Nine nature refuges and one resource reserve exist within 100 km of the Project Site. These are as follows:

- Eaglefield Creek Nature Refuge
- Bluegrass Nature Refuge
- German Creek Nature Refuge
- Lords Table Mountain Nature Reserve
- Nibbereena Creek Nature Refuge
- Norwich Park Nature Refuge
- Burwood Nature Refuge
- Caroa Island Paddock Nature Refuge
- Coolibah Nature Refuge.

A resource reserve is an area of land dedicated under the NC Act, and is administered by DES. The Homevale Resource Reserve is situated approximately 95 km from the Project Site.

None of these areas are downstream of the Project Site.

[2] Category C ESAs have been defined in the Code of Environmental Compliance for Exploration and Mineral Development Projects – Version 1.1 (DEHP). This document has been superseded however Category C ESAs are still relevant as confirmed by DES on 5 March 2018

State forests

State forests are declared under the *Forestry Act 1959* and administered by DES. There are no State forests within the Project Site. Thirteen State forests are situated within 100 km of the Project Site. These are:

- Apsley State Forest
- Blair Athol State Forest
- Bundoora State Forest
- Carminya State Forest
- Copperfield State Forest
- Crystal Creek State Forest
- Epsom State Forest 2
- Epsom State Forest 3
- Glencoe State Forest
- Junee State Forest
- Llandillo State Forest
- Rosedale State Forest
- Tierawoomba State Forest.

Declared catchment and irrigation areas

Areas of land that immediately surround water storage areas are termed ‘declared catchments’. Certain types of development proposed within declared catchment areas are referred to DES during the integrated development assessment system (IDAS) process to ensure the quality of water entering the storage facility is not degraded by proposed development (DNRM, 2010).

Within Queensland there are 20 declared catchment areas administered by DES, none of which are situated within 100 km of the Project Site.

There are no declared irrigation areas within the Project Site or downstream of the Project. There are no declared drainage areas within the Project Site.

River improvement areas

River improvement areas (RIA) are areas protected under the *River Improvement Trust Act 1940*. There are no RIAs within the Project Site.

Designated landscape area – Stanbroke Pastoral Holding

The Stanbroke Pastoral Holding designated landscape area does not occur within the Project Site. It is located approximately 60 km to the south of the township of Mount Isa.

Timber reserves

A timber reserve is land set apart and declared or deemed to be set apart and declared under the *Forestry Act 1959* as a timber reserve. There are no timber reserves in or within 100 km of the Project Site.

Critical areas and public purpose reserves

Critical areas and public purpose reserves are legislated under the *Land Act 1994* and administered by the DoR. No critical areas and public purpose reserves were mapped within the Project Site or surrounding region.

Coastal management districts

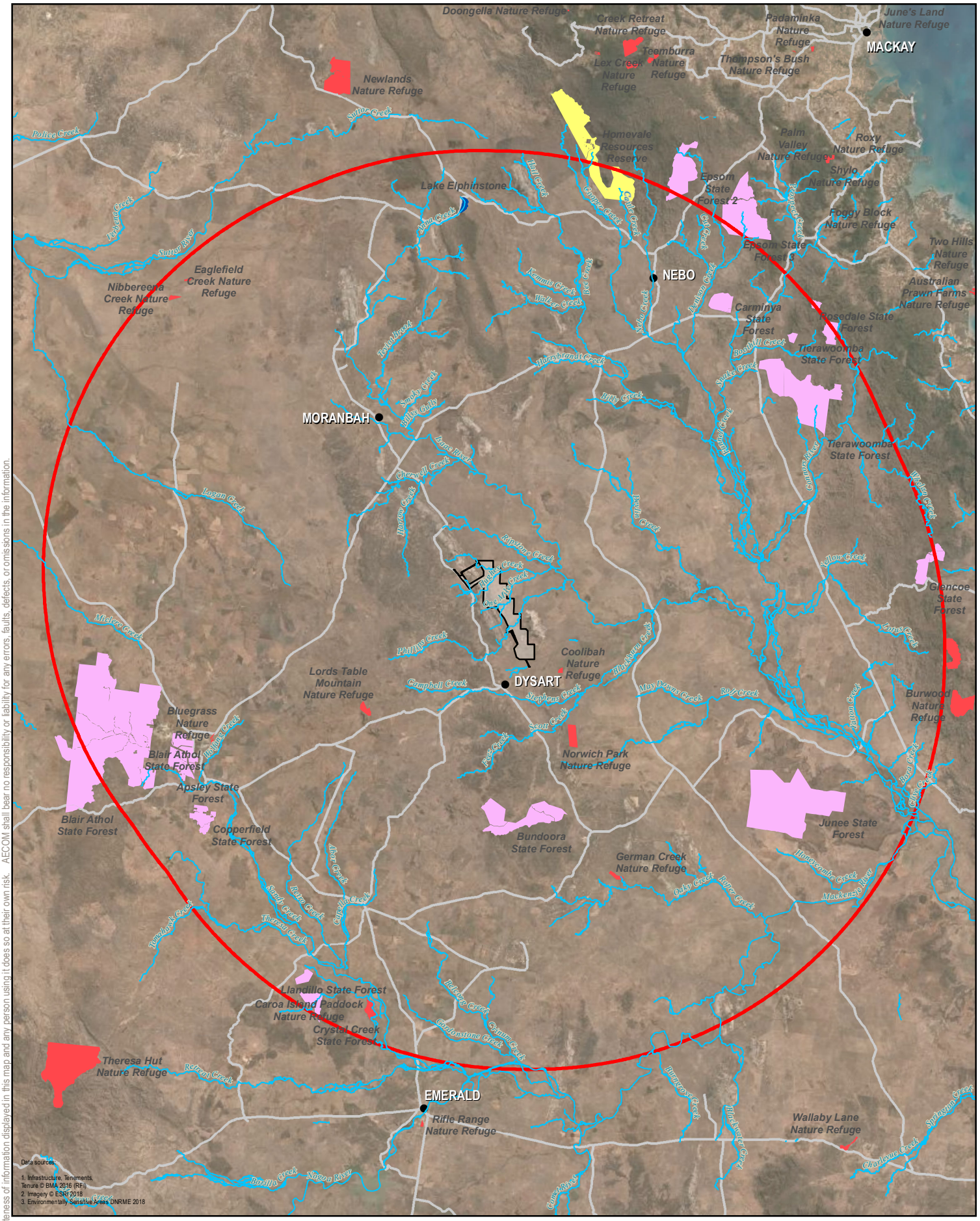
Coastal management districts occur over all tidal waters and on most land adjacent to tidal waters in Queensland (DEHP, 2012). Coastal management districts are declared under the *Coastal Protection and Management Act 1995*. There are no coastal management districts within 100 km of the Project Site.

Erosion prone areas

Erosion prone areas are declared under the *Beach Protection Act 1968*. There are no erosion prone areas within 100 km of the Project Site.

Dams and weirs

Dams and weirs owned and controlled by the Queensland Government are considered Category C ESAs. There are no dams or weirs controlled by the Queensland Government within the Project Site or the surrounding region.



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LEGEND

- Locality
- Project Site
- 100km Project Area radius
- Wetland (Directory of Important Wetlands)
- Major Road
- Watercourse

Category C ESA

- Nature Refuge
- Resource Reserve
- State Forest

N

Figure 24
Category C Environmentally Sensitive Areas

Environmental Impact Statement
Saraji East Mining Lease Project

0 5 10 20
Kilometres

Scale: 1:1,200,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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7.0 MNES

A detailed review of MNES occurring within the Project Site is provided as a standalone chapter of the Project EIS (BMA, 2024).

8.0 MSES

MSES include certain environmental values that are protected under Queensland legislation including:

- NC Act
- *Marine Parks Act 2004*
- *Fisheries Act 1994*
- EP Act
- *Regional Interests Planning Act 2014*
- VM Act
- EO Act.

Ground-truthed RE mapping has been ratified by the Queensland Herbarium through a formalised mapping amendment application. As such, the assessment of MSES Regulated vegetation has been calculated based on ground-truthed Regional Ecosystem mapping for the Project Site.

MSES values relevant to the Project and this assessment are presented below in Table 38.

Table 38 MSES values relevant to the Project and this assessment

MSES	Description	Present in the Project Footprint
Regulated vegetation	A prescribed regional ecosystems which is as endangered and of concern under the VM Act.	**Yes** Regulated vegetation as per MSES description i.e. ERE: • 6.58 ha of RE 11.3.1 • 222.45 ha of RE 11.4.8 • 32.56 ha of RE 11.4.9 Regulated vegetation as per MSES description i.e. Of concern RE: • 65.51 ha of RE 11.3.2 • 0.01 ha of RE 11.3.4
	A prescribed regional ecosystems which intersects the defined distance from the defining banks of a relevant watercourse or relevant drainage feature (being those that are identified on the vegetation management watercourse and drainage feature map).	**Yes** Regulated vegetation (intersecting a watercourse) as per the MSES description occurs within the Project Footprint: • 0.00 ha of RE 11.3.1 • 9.78 ha of RE 11.3.2 • 61.00 ha of RE 11.3.25 • 0.01 ha of RE 11.3.4 • 0.04 ha of RE 11.4.8 • 0.07 ha of RE 11.4.9 • 0.00 ha of RE 11.4.13 • 12.81 ha of RE 11.5.3 • 0.62 ha of RE 11.5.9b

MSES	Description	Present in the Project Footprint
	A prescribed regional ecosystem which intersects with an area shown as a wetland on the vegetation management wetlands map (to the extent of the intersection)	**Yes** Wetlands as per the MSES description are mapped in the north of the Project Footprint: • 0.24 ha of RE 11.3.2 • 0.02 ha of RE 11.5.3 • 1.89 ha of 11.3.27b
Wetland and Watercourses	Means an area shown as a wetland: • in a wetland protection area; or • of high ecological significance on the Map of Referrable Wetlands • or watercourse in high ecological value waters (as defined under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019, schedule 2.	**No** No wetland or watercourse protection areas occur within the Project Footprint.
Connectivity areas	Areas which consist of vegetation mapped as prescribed regional ecosystem that: • are of sufficient size or configured in a way that maintains ecosystem functioning; and • will remain despite a threatening process within the meaning of the *Nature Conservation Act 1999*.	**Yes** Connectivity areas occur within the Project Footprint as per the MSES description.
Protected wildlife habitat	Protected wildlife habitat includes: • an area of Essential Habitat on the Essential Habitat map for an animal or plant that is endangered or vulnerable wildlife • a high risk area on the flora survey trigger map which also contains endangered, vulnerable or near threatened (EVNT) plant species • a koala habitat area • an area which contains EVNT plants and is not shown on the flora survey trigger map • an area of habitat (e.g. foraging, roosting, nesting or breeding habitat) for an animal that is endangered, vulnerable or a special least concern animal	**Yes** Habitat for State listed species occurs within the Project Footprint, including: • Koala (*Phascolarctos cinereus*) (1,160.17 ha potential habitat) • Ornamental Snake (*Denisonia maculata*) (including Essential Habitat) (886.02 ha potential habitat) • Greater Glider (*Petauroides volans*) (748.13 ha) • Squatter Pigeon (*Geophaps scripta scripta*) (including Essential Habitat) (1,862.33 ha potential habitat) • Australian Painted Snipe (*Rostratula australis*) (712.97 ha potential habitat) • Grey Falcon (*Falco hypoleucos*) (3,113.57 ha potential habitat) • Short-beaked Echidna (*Tachyglossus aculeata*) (3,113.57 ha potential habitat). Estimated areas for protected fauna have been undertaken through habitat mapping where applicable.

MSES	Description	Present in the Project Footprint
Protected areas	This relates to protected areas as declared under the NC Act, including: • National parks • National parks (Aboriginal land) • National parks (Torres Strait Islander land) • National parks (Cape York Peninsula Aboriginal land) • Regional parks • Nature refuges.	**No.** No protected areas as per the MSES definition are present within the Project Footprint.
Fish Habitat Areas and Highly Protected Zones of State marine parks	• An area declared under the *Fisheries Act 1994* to be a fish habitat area. • A highly protected area of a relevant Queensland marine parks declared under the *Marine Parks Act 2004*.	**No** No State marine parks or fish habitat areas occur within the Project Footprint.
Waterway providing for fish passage	Any part of a waterway providing for passage of fish if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway.	**Yes** Waterways which provide for fish passage are present within the Project Footprint. The detailed design of the Project will determine if construction, installation or modification of waterway barrier works within these waterways will limit the passage of fish.
Marine plants	A marine plant within the meaning of the *Fisheries Act 1994.*	**No** Marine plants do not occur within the Project Footprint.
Legally secured offset area under State legislation	An offset area approved by the administering authority associated with a legislative or policy requirement for the provision of an offset.	**No** No legally secured offset areas are present within the Project Footprint.

9.0 Potential impacts

The following sections outline the potential impacts associated with the Project on terrestrial ecological values. The impact assessment discussed below is based on the potential impacts associated with the construction and operational phases of the Project. Disturbance calculations incorporate direct and indirect impacts relating to:

- construction:
  - surface facilities and ancillary infrastructure (direct)
  - incidental mine gas (IMG) drainage network (direct).
- operation:
  - subsidence from underground mining (indirect)
  - groundwater drawdown from water extraction (indirect).

9.1 Potential impacts on terrestrial ecology

9.1.1 Construction

Facilities and infrastructure associated with the Project includes the MIA, CHPP, water management infrastructure, roads, the IMG drainage network, as well as water and power supply to the Project Site. The construction of this infrastructure will occur in three stages:

- site preparation
- civil works including water storage and transport network and powerlines/connections
- MIA building and CHPP construction.

To manage and facilitate the construction of Project infrastructure, temporary facilities, including offices, will be constructed close to the work centres such as the MIA. The facilities will be located within the Project Footprint which may include previously disturbed areas. The construction accommodation village will only be required to support construction before the facilities are decommissioned and the area rehabilitated.

The Project Site covers approximately 11,427 ha, which comprises 2,613.59 ha of remnant and 8,813.41 ha non-remnant vegetation (Table 39). Of this, 1,449.39 ha of remnant and 1,898.61 ha of non-remnant vegetation is within the Project Footprint with potential to be disturbed.

Eight of the nine fauna habitat types (except Oxbow wetlands) identified in Section 5.2.1 and ten of the REs identified in Section 4.2.1 have potential to be impacted by the Project. Potential impact areas are quantified in Table 42 and identified in Figure 25 and Figure 26**.** This includes disturbances from construction components of the Project, including:

- surface facilities and ancillary infrastructure (construction village, CHPP, ROM pad, MIA, process water dam, raw water dam, proposed product stockpiles, conveyor, 66 kV powerline connection, transport infrastructure corridor)
- IMG drainage network comprising gas well pads and parallel corridors for the pipeline and associated access tracks (conservatively assessed 100 m width; however vegetation clearing will be minimised to 10-20 m for the pipeline, up to a maximum of 50 m in the case of vehicle tracks; sections of vegetation and habitat, approximately 260 m wide, will be retained between corridors).

9.1.1.1 Potential direct impacts

Flora and vegetation communities

Disturbance of remnant vegetation (groundtruthed RE) resulting from the construction is 180.38 ha, including surface infrastructure (120.56 ha) and IMG drainage network (59.82 ha). Table 39 below presents the breakdown of the potential direct impacts to vegetation communities and habitat types.

Disturbance to each vegetation community is indicated as a percentage of the community found within the Isaac Comet Downs sub-region of the Brigalow Belt Bioregion.

Impacts on vegetation and habitat will occur throughout the life of the Project. On commencement of construction, areas required for the proposed surface infrastructure will be cleared; however, surface infrastructure will be preferentially sited in previously disturbed areas. The IMG drainage infrastructure will be installed as early as possible to allow adequate time to drain gas prior to mining. While the maximum corridor width for linear infrastructure has been assessed, detailed design will further refine the layout to site within existing disturbed areas and reduce corridor widths to minimise disturbance. For the powerline easement, clearing will generally only be required for towers and a narrow access easement.

Surface infrastructure

The disturbance areas associated with the surface facilities and ancillary infrastructure intersects ten REs, five of which are listed as least concern, two of concern and three endangered under the VM Act. EREs (RE 11.3.1, RE 11.4.8 and RE 11.4.9) are also analogous with the *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC. The proposed construction village has been located in non-remnant vegetation (i.e. *Acacia harpophylla* (Brigalow) regrowth up to 1 m in height).

The CHPP, conveyors and product stockpiles are located within the existing Saraji Mine area and while vegetation clearing is required for all of these areas, this vegetation is partly disturbed and fragmented. The future MIA and the raw water dam are located in a highly disturbed area within the Saraji Mine area and will not require removal of remnant vegetation.

It is likely clearing impacts associated with the powerline connection and the transport and infrastructure corridor will be lower than estimated for the infrastructure footprint. Clearing for the powerline connection will only be required for footings and a narrow access easement. As such high value biodiversity values within the powerline connection footprint will be avoided and impacts minimised. The width of the infrastructure corridor is also expected to be reduced during the detailed design process.

Approximately 0.075 ha of *Dichanthium setosum* (Bluegrass) habitat occurs within the disturbance areas associated with the surface facilities and ancillary infrastructure (also mapped as *Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC). This habitat occurs within and adjacent to the transport infrastructure corridor where the proposed overhead power transmission line is expected to span overhead with limited to no clearing required for its construction. In this area, there is low likelihood that vehicle traverses during construction will lead to increased or new weed incursions, excessive dust or the contamination of soils and water.

IMG drainage network

The IMG drainage network will disturb remnant vegetation across seven REs, three with endangered status and one of concern status under the VM Act (Table 39). The EREs (i.e. RE 11.3.1, RE 11.4.8 and RE 11.4.9) and analogous TEC will experience some clearing for the network, however, the majority of the infrastructure is situated within modified grassland, shrubby *Acacia harpophylla* (Brigalow) regrowth and *Eucalyptus populnea* (Poplar Box) woodland.

Of the EREs, also listed as the endangered TEC *Brigalow (Acacia harpophylla dominant and co-dominant)*, approximately 25.06 ha will be cleared. In terms of total area of remnant *Acacia harpophylla* (Brigalow) communities cleared for the IMG drainage network, the largest affected area is of RE 11.4.8, of which 16.89 ha will be cleared (Table 39). In a regional context, this equates to approximately 0.08 per cent of the subregional extent of RE 11.4.8.

In addition to reduction in extent of EREs and TECs, disturbance to the riparian communities which border Boomerang Creek, Hughes Creek and Plumtree Creek must also be considered. Vegetation communities associated with these creeks include *Eucalyptus* and/or *Corymbia* woodlands on alluvial plains (RE 11.3.2, RE 11.3.25 and RE 11.3.27b). These REs form a west-east corridor for fauna movement within the Project Site. This corridor is recognised as significant at the State level under the BPA for the Brigalow Belt.

While design of the layout of the IMG drainage infrastructure has not yet been finalised, it is intended to restrict the number of times that the infrastructure crosses these creeks to minimise direct disturbance to this corridor. Some pipeline crossings will be required and these will be trenched crossings, with

disturbed areas reinstated to stabilise the river bed and banks. Wherever possible, the wells required for IMG drainage will be installed outside of the riparian zone. With these design measures in place, riparian vegetation connectivity will largely be retained along these creek systems during the construction phase of the Project.

The IMG drainage network will be constructed in a grid like pattern. As a result, vegetation will still occur in patches between the gas drainage infrastructure. The majority of the IMG Drainage network footprint comprises non-remnant vegetation, with minor areas containing REs, including Brigalow TEC. Areas of retained vegetation within the grid formed by the IMG drainage infrastructure, at least 260 m wide, will be fragmented and subject to potential indirect impacts, such as edge effects and dust deposition from gas management infrastructure construction activities. This may result in the degradation of vegetation and habitat adjacent to works. These impacts are also discussed in Section 9.1.2.

Table 39 Potential Disturbance to Vegetation Communities during construction

RE	Status[1]			Project Site (ha)	Project Footprint (ha)	Construction components (ha)[2]		Total Extent within Subregion (ha)	Total Construction Impacts	
	EPBC Act	Biodiversity	VM Act			Surface Facilities	IMG drainage network		Total Construction Impact Area (ha)	% of Subregion
RE 11.3.1	E	E	E	15.76	6.58	0.45	1.51	22,355	1.96	0.01
RE 11.3.2	NL	OC	OC	151.14	65.51	16.42	2.70	37,797	19.12	0.05
RE 11.3.4	NL	OC	OC	23.05	0.01	0.01	-	9,062	0.01	<0.01
RE 11.3.25	NL	OC	LC	192.08	73.42	6.49	5.41	47,044	11.89	0.02
RE 11.3.27b	NL	OC	LC	16.64	3.04	-	3.04	976	3.04	0.19
RE 11.4.4	E	OC	LC	1.73	0.075	0.075	-	1,931	0.075	<0.01
RE 11.4.8	E	E	E	322.35	222.45	24.33	16.89	20,023	41.22	0.27
RE 11.4.9	E	E	E	188.57	32.56	-	6.66	23,782	6.74	0.03
RE 11.4.13	NL	OC	LC	222.14	38.03	38.03	-	4,863	38.03	-
RE 11.5.3	NL	NCP	LC	1480.12	778.66	34.75	23.61	71,713	58.36	<0.01
Non–remnant	NL	NL	NL	8,823.42	2,127.74	679.08	290.13	NA	969.21	NA
Total				**11,437.00**	**3,348.09**	**799.63**	**349.95**	**NA**	**1,329.94**	**NA**

Note 1: Status E – endangered; OC – of concern; LC – least concern; NCP – no concern at present; Non-remnant – non- remnant vegetation; NL – not listed

Note 2: Construction areas comprised of direct impacts from surface infrastructure and IMG drainage network as quantified in this table.

Fauna and habitats

Surface facilities and ancillary infrastructure

Clearing for the proposed infrastructure will have direct impacts on fauna and fauna habitat during vegetation clearing activities. Habitat types directly impacted include *Eucalyptus* and/or *Corymbia* Open Woodland, Brigalow or Belah Woodland, River Red Gum Riparian Woodland, Dawson Gum and Brigalow Woodland, modified grasslands, shrubby brigalow regrowth with gilgai, oxbow wetlands and dams (see Figure 26). The locations for the proposed construction village has been situated where no remnant vegetation is mapped. However, the area does provide suitable habitat for Ornamental Snake (*Denisonia maculata*) with gilgai and cracking clay present in both areas, although ground timber was absent.

The proposed infrastructure to the west of the Saraji Mine including the CHPP, MIA, conveyor, ROM pad, stock piles and dams are located close to existing mining areas and while there is some remnant vegetation in the footprints of these facilities, this vegetation has limited connectivity and habitat value. Clearing associated with these facilities is likely to have minimal impacts on fauna species utilising the Project Site.

Impacts on fauna from installation and operation of the IMG drainage infrastructure may occur from:

- loss of habitat from direct clearing of vegetation, including habitat trees, which will restrict the ability of fauna to move across the Project Site
- injury or mortality to fauna present during vegetation clearing activities and surface infrastructure construction.

The road alignment passes largely through modified grassland habitat however the alignment will bisect a large patch of *Eucalyptus populnea* (Poplar Box) woodland and will require crossings over Boomerang Creek, Hughes Creek, Plumtree Creek, Spring Creek and Phillips Creek (Table 40). The riparian communities surrounding these creek crossings have a comparatively high faunal diversity. The proposed transport and infrastructure corridor will be further refined to minimise potential for minor interruption of fauna dispersal opportunities and roosting/nesting resources. Given the width of the proposed clearing, the impact on fauna from the construction of the transport and infrastructure corridor is likely to be minimal.

Potential impacts on different habitat types across the Project Site are discussed in Table 41.

Table 40 Watercourse crossing locations potentially impacted by the Project

Watercourse Crossing	Project infrastructure	Stream Order	Watercourse Name	Latitude (GDA94)	Longitude (GDA94)
WC1	Rail loop	2	-	-22.3419	148.2318
WC2	Surface infrastructure	1	-	-22.3584	148.2522
WC3	Surface infrastructure	1	-	-22.3738	148.2622
WC4	Transport Infrastructure corridor Pipeline	4	Boomerang Creek	-22.3215	148.2788
WC5	Transport Infrastructure corridor	4	Boomerang Creek	-22.3165	148.2803
WC6	Pipeline	4	Boomerang Creek	-22.3311	148.3085
WC7	Img network	4	Hughes Creek	-22.3501	148.3221
WC8	Img network	4	Hughes Creek	-22.3461	148.3253
WC9	Transmission corridor	1	-	-22.4192	148.328
WC10	Img network	4	Hughes Creek	-22.3449	148.3288
WC11	Transport Infrastructure corridor	4	Boomerang Creek	-22.3369	148.3289
WC12	Transport Infrastructure corridor	4	Hughes Creek	-22.3418	148.3341
WC13	Transmission corridor	3	One Mile Creek	-22.4268	148.3379
WC14	Transport Infrastructure corridor	3	One Mile Creek	-22.4068	148.3543
WC15	Transmission corridor	4	Phillips Creek	-22.4609	148.3564
WC16	Transmission corridor	1	-	-22.4868	148.3707
WC17	Transport Infrastructure corridor	1	-	-22.4666	148.3763
WC18	Transport Infrastructure corridor	4	Phillips Creek	-22.4438	148.378
WC19	Transport Infrastructure corridor	1	-	-22.4624	148.3786
WC20	Transport Infrastructure corridor	1	-	-22.461	148.3792
WC21	Transmission corridor	1	-	-22.5161	148.3875
WC22	Transmission corridor	2	-	-22.5418	148.4024
WC23	Transmission corridor	3	Downs Creek	-22.5423	148.4028

Table 41 Potential direct impacts associated with the IMG drainage network on habitat types within the Project Site

Habitat type	Impact Description
Brigalow – Dawson Gum and Brigalow Woodland/Brigalow or Belah Woodland/Shrubby Brigalow regrowth with gilgai	Remnant Brigalow habitat within the IMG occurs largely as several patches of RE 11.4.8 and RE 11.4.9 with areas of shrubby brigalow regrowth also disturbed. IMG management infrastructure will be required to cross through these patches at a number of locations, creating gaps in the brigalow habitat of 10-20 m in width, as well as cleared pads for gas wells. This will reduce the extent of this habitat as well as reducing connectivity and restricting animal movement. As outlined in Section 5.2.1, abundance and diversity of fauna in the Brigalow habitat was generally low; however, brigalow habitat is associated with habitat for the threatened Ornamental Snake (*Denisonia maculata*).
River red gum riparian woodland and oxbow wetlands	Riparian and alluvial woodlands were identified during field surveys as supporting a high abundance and diversity of fauna, especially arboreal mammals and also form the majority of the State biodiversity listed corridor through the Project Site. Large, mature *Eucalyptus camaldulensis* (River Red Gum) trees present in riparian habitats frequently contained hollow limbs which provide denning sites for arboreal mammals and microbats and nesting sites for many bird species such as parrots, owls and Dollarbird (*Eurystomus orientalis*). Riparian and alluvial woodlands within the IMG drainage network are largely associated with Boomerang Creek, Hughes Creek and the oxbow wetlands in the north-west of the Project Site and as such, direct impacts will be limited to the crossings at these locations, primarily along Hughes Creek (Table 40). Placement of IMG infrastructure in riparian areas will also be avoided wherever possible. While crossings of these creeks will reduce connectivity by creating gaps of 20 m to 50 m in width in the case of vehicle tracks, and 10 m to 20 m in width in the case of pipeline crossings, overall the loss of riparian habitat is minimal. Arboreal mammals will be able to move across the crossings provided that tall trees are retained on either side. Fauna using the riparian corridor may also be discouraged by noise, light and other activity associated with the installation and management of the IMG drainage infrastructure, although such disturbance will be intermittent and noise levels are not predicted to be particularly significant. Overall, significant degradation of habitat values is not expected, and minor degradation of connectivity will occur.
Eucalyptus and/or *Corymbia* open woodlands	Within the IMG drainage network, this habitat type consists of *Eucalyptus populnea* (Poplar Box) woodlands on alluvium or Cainozoic sandy plains. This community was identified as supporting a range of woodland bird species and a high density of hollows that may support arboreal mammals particularly where a diversity of myrtaceous tree species persist. Despite this, arboreal mammal diversity was found to be relatively low in this habitat type with the exception of microchiropteran bat species which were regularly recorded. Of the remnant vegetation communities within the Project Site, *Eucalyptus* and/or *Corymbia* open woodlands will experience the most significant clearing and fragmentation for the IMG drainage network. Although some reduction in fauna dispersal opportunities is expected, this community was typically open and as such impacts from clearing for tracks, wells and pipelines will not be as pronounced as some other communities. Movement for small bodied species may be impeded however the species assemblage noted to be using this habitat type largely comprised highly mobile species. Overall, impacts to this community as a result of the IMG drainage network are not considered to be significant to fauna. Retention of habitat trees and felled timber for microhabitat will reduce impacts by promoting dispersion and providing habitat resources.
Natural grasslands	Natural grassland habitat is not affected by the IMG drainage infrastructure.

Habitat type	Impact Description
Modified grassland	Large areas of modified grassland will be affected by the IMG management infrastructure. This habitat type is identified as having relatively low habitat values due to a lack of native vegetation. However, it is utilised by Eastern Grey Kangaroo (*Macropus giganteus*), Squatter Pigeon (*Geophaps scripta scripta*) and other bird species such as Brown Quail (*Coturnix ypsilophora*) which do not have specific habitat preferences and utilise a wide range of native and modified habitats. Given the widespread extent of this habitat throughout the Project Site and sub-region, it is unlikely that loss of this habitat will have any significant impacts on fauna.
Dams	No dams are expected to be impacted by the IMG drainage network. Water resulting from the IMG network will be collected and transferred to the process water dam. The process water dam is not likely to provide important habitat.

The above impacts on fauna are based on the area of vegetation cleared once the construction of the IMG drainage network is completed (Table 42). However, the IMG drainage network will be undertaken progressively, such that loss of habitat values will be gradual and there will be opportunities for fauna to move into adjacent habitat or into areas that will have already undergone partial rehabilitation. Suitable habitat is available to the north and east of the proposed mining footprint. Competition for resources and territory within these new areas may affect some species; however, most species present on site are relatively resilient and do not have highly specific habitat preferences. Additionally, an increase in predation may occur as a result of dispersing.

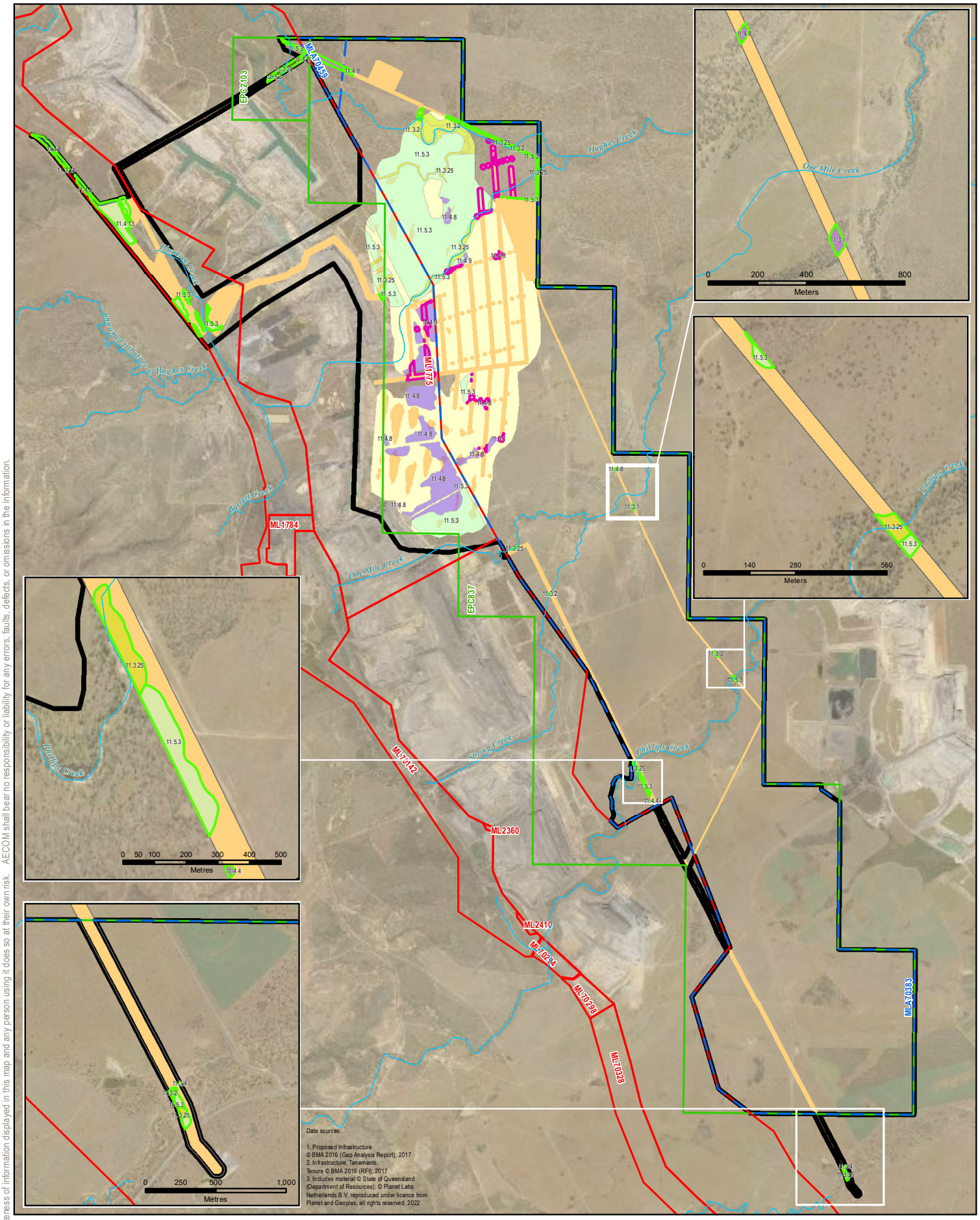
Many of the fauna species observed within the Project Site are relatively tolerant to disturbed habitats and may continue to utilise remaining habitat in spite of fragmentation and noise, light and activity disturbance. As installation of the IMG infrastructure progresses, food and shelter resources will be diminished and density of fauna in the area may also diminish.

The main west-east corridor associated with Boomerang Creek, Plumtree Creek and Hughes Creek, will be largely retained and fauna use and movement along this corridor should remain possible.

Overall, impacts on fauna from the IMG management infrastructure are largely related to loss of habitat trees and reduced connectivity.

Table 42 Potential disturbance to fauna habitat types during construction

Fauna Habitat Type	RE associations	Project Site (ha)	Project Footprint (ha)	Construction components (ha)		Total direct impacts of construction (ha)
				Surface Facilities	IMG drainage network	
River Red Gum Riparian Woodland	RE11.3.25	192.08	73.42	6.49	5.41	11.90
Eucalypts and/or *Corymbia* open woodland	RE11.3.2, RE11.3.4, RE11.4.13, RE11.5.3	1,876.46	882.21	89.22	26.31	115.53
Dawson Gum and Brigalow Woodland	RE11.4.8	322.35	222.45	24.33	16.89	41.22
Brigalow or Belah Woodland	RE11.3.1, RE11.4.9	204.33	39.15	0.45	8.17	8.62
Oxbow Wetland	RE11.3.27b	16.64	3.04	-	3.04	3.04
Natural Grasslands	RE11.4.4	1.73	0.075	0.075	-	0.075
Modified Grasslands	NA	6,418.86	1,420.13	458.00	194.71	652.71
Shrubby Brigalow regrowth with gilgai	NA	1,781.99	636.89	190.92	95.22	286.14
Dams	NA	107.66	70.72	30.16	0.20	30.36
Total		**10,922.10**	**3,348.09**	**799.65**	**349.95**	**1,149.60**



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Construction Impacts Intersecting Flora Values

- Surface Infrastructure
- IMG Drainage Network

Regional Ecosystem biodiversity status

- Endangered
- Of Concern
- No Concern at Present

N

Figure 25
Potential Construction Impacts on Vegetation Communities and Flora

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

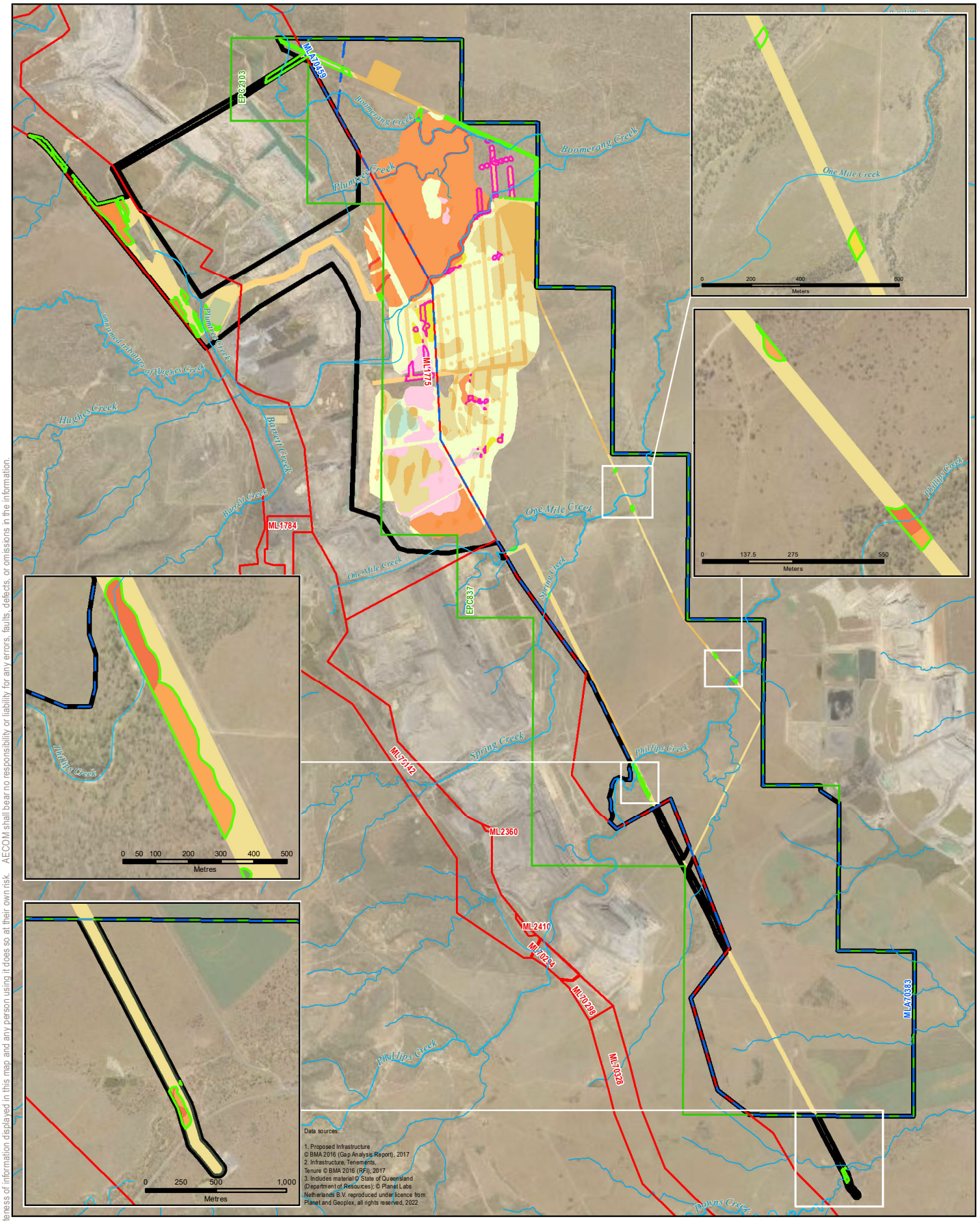
Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Construction Impacts Intersecting Fauna Habitat

- Surface Infrastructure
- IMG Drainage

Remnant Habitat Types

- River red gum riparian woodland
- Eucalyptus and Corymbia open woodland
- Dawson gum and brigalow woodland
- Brigalow and belah woodland
- Natural grasslands

Non-remnant Habitat Types

- Modified Grasslands
- Shrubby Brigalow Regrowth with Gilgai
- Dams

N

Figure 26
Potential Construction Impacts on Fauna Habitat Values

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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9.1.1.2 Potential indirect impacts

Potential indirect impacts associated with the construction phase include:

- erosion and soil loss
- dust impacts
- fragmentation and edge effects
- noise and light impacts
- traffic movements
- pests and feral fauna
- weeds.

Erosion and soil loss

Soil erosion may occur in areas disturbed by activities associated with the Project. Where these activities occur on dispersive soils and/or on slopes, mobilisation of sediment into watercourses can occur. Impacts to aquatic ecosystems can include build-up of sediment in waterholes with a resultant reduction in available microhabitat, and smothering of aquatic plants and substrate (refer to **Chapter 7 Aquatic Ecology** (BMA, 2024) of the EIS for further details).

Erosion can remove the most productive part of the soil profile, the topsoil, resulting in a greatly reduced opportunity for natural regeneration of vegetation communities (unless stock piled). Impacted areas most susceptible to erosion include floodplain areas and riparian vegetation associated with Boomerang Creek, Plumtree Creek, Hughes Creek, One Mile Creek, Spring Creek and Phillips Creek, as well as those vegetation communities associated with erosive sand or silt land zones.

Topsoil resources can be protected by removing topsoil altogether from areas of high disturbance and setting the topsoil aside for reuse in rehabilitation programs. Where topsoil is left in situ in disturbed areas, erosion and sediment control measures are required to minimise loss of topsoil. These are discussed in more detail in **Chapter 5 Land Resources and Soil** (BMA, 2024) of this EIS.

Dust impacts

Dust impacts generated during the construction of the Project may negatively affect vegetation.

Localised dust effects are likely to arise during the following activities:

- vegetation clearing and earthworks associated with construction of surface facilities such as the construction village and access road, the MIA, CHPP, ROM pad, rail balloon loop and conveyor. Dust from these activities will occur over a relatively short duration, typically several months. Dust plumes may affect vegetation adjacent to these areas.
- vegetation clearing, earthworks and vehicle movements associated with installation of the IMG management infrastructure. This will occur at varying locations across the underground mine footprint throughout the life of the mine and will affect vegetation in the immediate vicinity of works for several months at a time.
- dust from stockpiles at the MIA, CHPP and train load out. Dust control measures are proposed as specified in **Chapter 11 Air Quality and Greenhouse Gas** (BMA, 2024) of the EIS, and should minimise any significant dust impacts in adjacent areas.

Deposition of airborne dust, sand and soil may have potential impacts on vegetation if excessive levels are sustained over extended periods. When dust settles on plant foliage, it can reduce the amount of light penetration on the leaf surface, block and damage stomata, and slow rates of gas exchange and water loss. Diminished ability to photosynthesise due to physical effects may result in reduced growth rates of vegetation and decreases in floral vigour and overall community health. The potential effects of dust deposition on vegetation are determined by a number of factors including:

- the characteristics of leaf surfaces, such as surface roughness, influencing the rate of dust deposition on vegetation
- concentration and size of dust particles in the ambient air and its associated deposition rates
- local meteorological conditions and the degree of penetration of dust into vegetation.

Some additional localised dust deposition across the proposed underground mine footprint may occur immediately adjacent to access roads, drilling pads and other areas disturbed by the IMG drainage network and surface infrastructure.

The dominant woodland species within the Project Site typically exhibit physiological qualities that limit sensitivity to dust deposition. The sclerophyllous foliage of *Eucalyptus*, *Acacia* and *Corymbia* species is generally pendulous (i.e. points down), with a thick smooth cuticle that does not encourage particulate matter to remain on the surface. The dominant woodland species are also generally hardy and well adapted to adverse conditions such as extended dry conditions and low nutrient soils. Grassland species are generally more tolerant of dust due to the lack of surface area available for dust particles to settle on.

Vegetation situated in close proximity to construction activities may become coated with dust and suffer some of the impacts discussed above; however, this will be short term and unlikely to cause any significant damage. Vegetation immediately adjacent to access tracks used for the IMG drainage network may also suffer some dust deposition from vehicle movements, however, will not be continuously exposed to dust. The transport/infrastructure corridor will provide the primary access to the construction village and therefore adjacent vegetation will suffer from more continuous exposure to dust impacts. However, vegetation adjacent to the transport/infrastructure corridor is primarily non-remnant shrubby regrowth and modified grasslands with several disparate patches of remnant vegetation.

Use of water sprays to control dust in exposed areas is likely to be sufficient to prevent any long term impacts.

Fragmentation and edge effects

Fragmented vegetation communities will be subjected to increased edge effects, which when considered in combination can reduce the effective size of habitat fragments. The proposed IMG infrastructure will, in particular, lead to creation of a number of habitat patches (approximately 260m wide) which may be subject to edge effects. To a lesser extent, construction of other surface facilities and infrastructure will also create edges adjacent to remnant vegetation patches.

Edge effects can include:

- increased risk of weed invasion from disturbed areas
- increased exposure of fauna to predation due to increased visibility
- microclimatic changes associated with increased sunlight
- increased weed proliferation.

Weeds are already prevalent and distributed across the Project Site. However, there is a risk that disturbance to native vegetation, changes to microhabitat and mobilisation of earthmoving equipment and materials may introduce or exacerbate weeds within the Project Site.

Ground dwelling fauna are most at risk from increased predation around the edges of remnant habitat as fauna are more visible and accessible. Although there is limited ground dwelling fauna present in the Project Site, this may further reduce populations.

As most of the vegetation within the proposed underground mine footprint is open woodland to grassland, significant vegetation changes are not likely to occur as a result of increased exposure to sunlight along the edges of remnant vegetation.

Noise and light impacts

Secondary impacts to fauna include disturbance from noise and light during construction of surface facilities and infrastructure and IMG management infrastructure. Fauna will generally move away from

noise and light sources as these may be perceived as a threat. Acclimatisation by some species is likely to occur over the medium to long term and many of the species identified in the Project Site are known to occur in areas subject to noise, light and general activity.

Construction of the IMG management infrastructure will result in noise disturbance and, in the case of well installation, which will occur as a 24-hour activity, light disturbance. This disturbance will be short term in each location as the infrastructure is installed progressively from west to east across the proposed mine footprint and fauna disturbed by noise or light will be able to temporarily move into adjacent habitat. Fauna present within the mine footprint area are expected to either habituate to the disturbance or temporarily move away.

Overall, some disturbance to fauna is expected from light and noise across the Project Footprint and this may have short term impacts on feeding and resting behaviour which in turn can affect animal health. It is also possible that fauna particularly sensitive to noise and light will become locally extinct within the Project Footprint. Long term effects are not anticipated for most fauna species identified as these species are expected to habituate to higher noise and brighter light levels.

Traffic movements

Conflict between site traffic and fauna is expected to occur, particularly associated with vehicle movements of the construction villages and preparation of the transport/infrastructure corridor. Construction and maintenance activities will be undertaken predominantly during daylight hours. Given this, reptiles are the fauna group most likely to be affected, as they utilise roads to gather warmth and seek prey. Macropods (kangaroos and wallabies) are more likely to be collided with at sunrise, sunset and periodically during the night.

Pests and feral fauna

The survey area supports populations of Rabbits (*Oryctolagus cuniculus**), Foxes (*Vulpes vulpes**), Pigs (*Sus scrofa**), Feral Cats (*Felis catus**), Wild Dogs (*Canis lupus dingo/ familiaris**), house mouse (*Mus musculus**) and Cane Toads (*Bufo marinus**). Ponds are likely to be created from subsidence impacts and may vary from areas of intermittent inundation to semi-permanent ponds. Ponds will potentially create new habitat opportunities for some of the pest fauna species recorded including Cane Toad (*Bufo marinus**) and pig (*Sus scrofa**). It is unlikely that the proposed works will significantly result in the further proliferation of the remainder of these species or the introduction of further feral vertebrate species.

The introduction of exotic ant fauna is a risk due to import of construction materials. Yellow Crazy Ants (*Anoplolepis gracilipes**) and Fire Ants (*Solenopsis invicta**) are exotic ants that have the potential to affect native flora, fauna and ecological communities. These ants are capable of being transported from infested sites to new construction sites on equipment or within materials. While efforts to control spread of both of these ant species have been quite effective, the spread of ants to new areas is a potential issue and needs to be monitored. No exotic ants are known to occur within the Project Site.

The construction of water storages and dams has the potential to create conditions suitable for a build-up of biting insects. Biting pests such as mosquitoes can rapidly increase populations when appropriate breeding conditions are provided.

Weeds

A diversity of weeds are already prevalent and distributed across the Project Site, including 40 exotic species, 11 of which are considered to be ‘Restricted Matter’ under the *Biosecurity Act 2014*, eight of which are WoNS and nine considered weed species under the Isaac Regional Biosecurity Plan.

There is a risk that disturbance to native vegetation and mobilisation of earthmoving equipment and materials may introduce new weeds or exacerbate existing weed populations within the Project Site.

The most likely causes of weed dispersal will be through the movement of soil and attachment of seed (and other propagules) to construction vehicles and machinery involved with clearing of vegetation and stockpiling mulch and topsoil during earthworks.

9.1.2 Operation

Potential impacts to flora and vegetation communities during the operational phase of the Project include:

- Subsidence related impacts from longwall mining such as
  - surface cracking
  - changes to topography
  - changes to the surface water drainage characteristics
- Groundwater drawdown from water extraction
- Other indirect impacts, similar to the construction phase, including:
  - noise and light
  - dust impacts; and
  - proliferation of weeds and pests.

Mining for the Project will occur progressively in a west to east direction. After pre-drainage of IMG, the IMG drainage surface infrastructure will be decommissioned and above ground infrastructure removed. Longwall mining will then be undertaken in these areas; in some cases, an estimated 15 years may occur between the two activities. Mining of each longwall is expected to take one to three years, and any associated impacts will progress across the Project Footprint as mining advances.

As longwall mining progresses, the overlying stratum drops in behind resulting in subsidence effects (Palamara et al. 2006). The magnitude of the subsidence effects are largely dependent on a range of variables, including the current topography, underlying geology, soils and depth of the longwall mining operations as described in detail in the Project's Subsidence Modelling Report (Minserve, 2022).

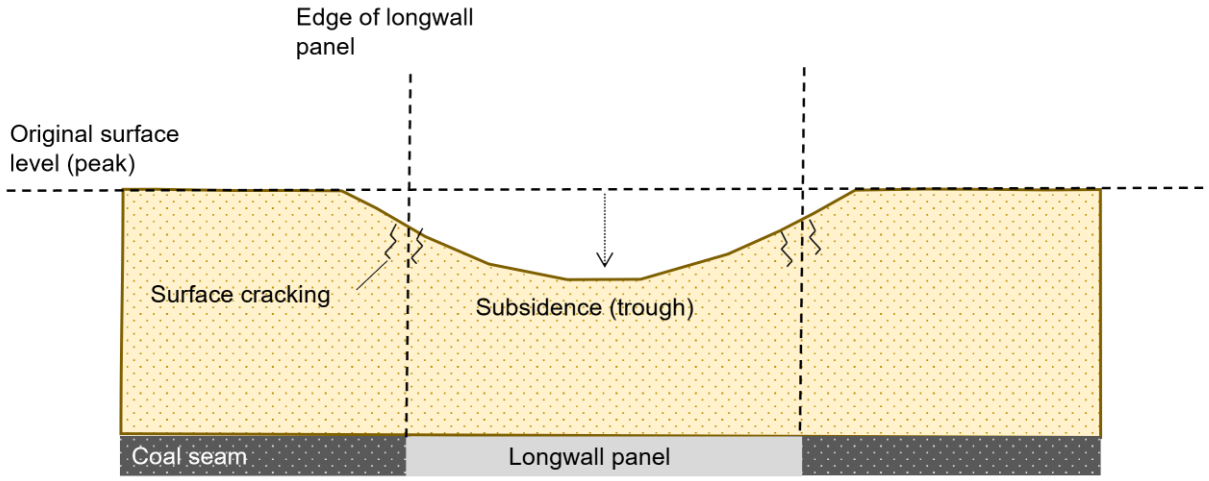


Figure 27 Conceptual model of subsidence resulting from longwall mining

Associated impacts from subsidence are typically localised and dependent on the location of vegetation in association with the subsided areas, with impacts generally associated with the depressions (troughs) and longwall panel edges (slopes) as opposed to areas not subject to subsidence (i.e. between mined panels) as illustrated in Figure 27. A summary of potential subsidence impacts on vegetation include:

- potential ground subsidence of 0-3.5 m as per modelling predictions (Minserve, 2022)
- ground movements and surface cracking at the edge of mined panels affecting root zones of isolated trees (Lechner et al., 2016; Darmody, 2000; Booth and Spande, 1992)
- persistent ponding within deeper depressions where there is no surface drainage system to manage runoff (Lechener et al. 2016)

- chemical or physical changes in soils remaining wet or waterlogged for long periods (Darmody et al., 1989) with potential for denitrification, loss of fertility and anaerobic consumption of organic matter reducing the health and condition of native vegetation present
- accumulated salts with subsequent evaporation leading to localised soil salinity or sodicity and associated physical changes in soil structure (Lechener et al. 2016).

Subsidence may affect isolated trees where ground movements and surface cracking affect root zones, however these impacts are unlikely to materially impact remnant status or habitat values associated with native vegetation (including threatened species and ecological communities). Application of remedial drainage works will ensure a free-draining final landform is permanently established in the final landform avoiding impacts associated with waterlogged areas.

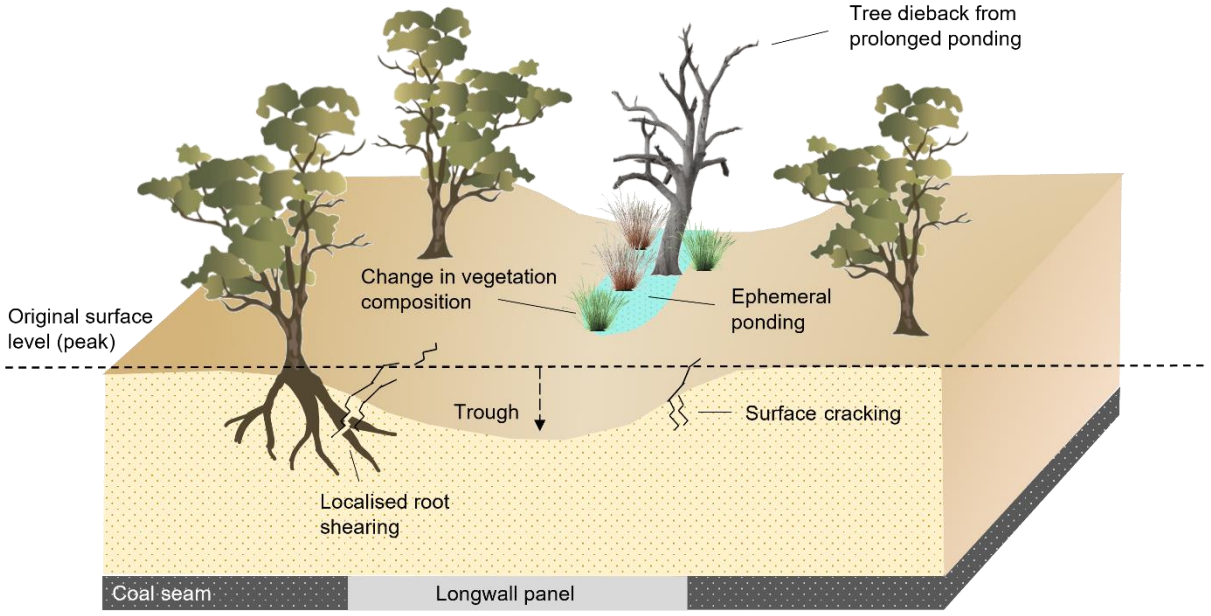


Figure 28 Conceptual model of potential subsidence impacts on vegetation

The sections below provide further detail on the potential direct and indirect impacts to vegetation and fauna habitat associated with operational impacts from the Project. Potential impacts associated with operation of the Project within the surface infrastructure and IMG drainage network infrastructure have been excluded from the operation impact calculations as these areas have already been captured in association with the direct impacts during the construction phase of the Project.

9.1.2.1 Potential direct impacts

Subsidence-induced ponding

The Conceptual Ponding Assessment (Engeny, 2023) presents modelling and water balance over the catchment in the subsided landform, which identified a maximum extent of potential ponded areas comprising 36 discrete ponding areas, spanning 145.66 ha, over the life of the mine Figure 27). It is predicted two-thirds of these areas subject to ephemeral ponding will develop over the first 10 years of the Project, with the remainder developing during the second decade of mining. While remedial drainage works are proposed to mitigate persistent ponding areas, a summary of the potential ponding impacts to vegetation communities is provided in Table 43 and maximum extent of impacts depicted in Figure 29.

Vegetation in ponded areas will be inundated periodically with potential to contain water from rainfall more than 50 per cent of the time. Where ponding is temporary, typical floodplain species (such as *Eucalyptus tereticornis, E. camaldulensis*) able to tolerate periodic inundation are likely to remain (Jackson, 2005). Where vegetation is intolerant to this inundation (such as *Eucalyptus populnea*), there is potential for these areas to exhibit tree die back and, in some areas, to be replaced by more tolerant vegetation, including environmental weeds. These changes in flora species composition can also result

in modifications to the vegetation type, with grassy woodland communities replaced with shrublands and grasslands.

Subsidence within Hughes Creek may also result in areas of deeper ponding (Table 43). These areas are expected to fill with sediment much faster than the land-based ponding areas (i.e. within the life of mine) due to the waterway ponding areas having a much larger upstream catchment area.

Without intervention, the ponded areas are likely to gradually fill with sediment settled out of the stored water over time (dependent on volumes and catchments). As such, areas subject to prolonged ponding are assessed as having potential to result in change or loss of species present, particularly woody vegetation sensitive to waterlogging. Ongoing monitoring of the soil properties and vegetation health will be required to identify decline in vegetation condition to allow appropriate management measures to be implemented.

Table 43 Vegetation communities potentially subject to ponding

Ground-truthed RE	Status		Project Footprint (ha)	Maximum extent pf ponding areas (ha)
	Biodiversity	VM Act		
11.3.25	OC	LC	73..42	2.94
11.4.8	E	E	222.45	12.45
11.4.9	E	E	32.56	0.09
11.5.3	-	LC	778.66	37.58
Total				**52.97**

Note 1: Status E – endangered; OC – of concern; LC – least concern.

9.1.2.2 Potential indirect impacts

Subsidence

Although subsidence does not directly remove vegetation and habitat, changes to local topography, soils and hydrology can potentially affect vegetation, particularly woody vegetation and impact on available habitat resources.

Vegetation communities occurring within the Project's modelled subsidence extent include six REs, as well as the *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC (Figure 10). These REs occur in several patches within the subsidence area with a combined total area of 1,039.97 ha. A summary of the extent of field verified REs within the modelled subsidence footprint is provided in Table 44 and depicted in Figure 29. While these areas are located within the predicted subsidence extent, not all areas may be impacted by subsidence, which largely dependent on the location and proximity to the subsided longwall panels. Prior to subsidence, some areas of vegetation will also have been previously disturbed from the installation of surface infrastructure and the IMG management infrastructure as described in Section 9.1.1.

Potential subsidence impacts within the trough areas can include soil compaction, changes in soil composition and ponding of water within deeper depressions. Soil compaction can occur within the central zone of the subsidence area (trough), potentially resulting in higher resistance to root growth and water penetration into the soil profile (Lechner et al., 2016). Deeper depressions may also be subject to periodic inundation, impacting the health and composition of vegetation present. Waterlogged areas may also accumulate salts from pore water and on-flow, with subsequent evaporation leading to localised soil salinity or sodicity and associated physical changes in soil structure (Lechener et al. 2016).

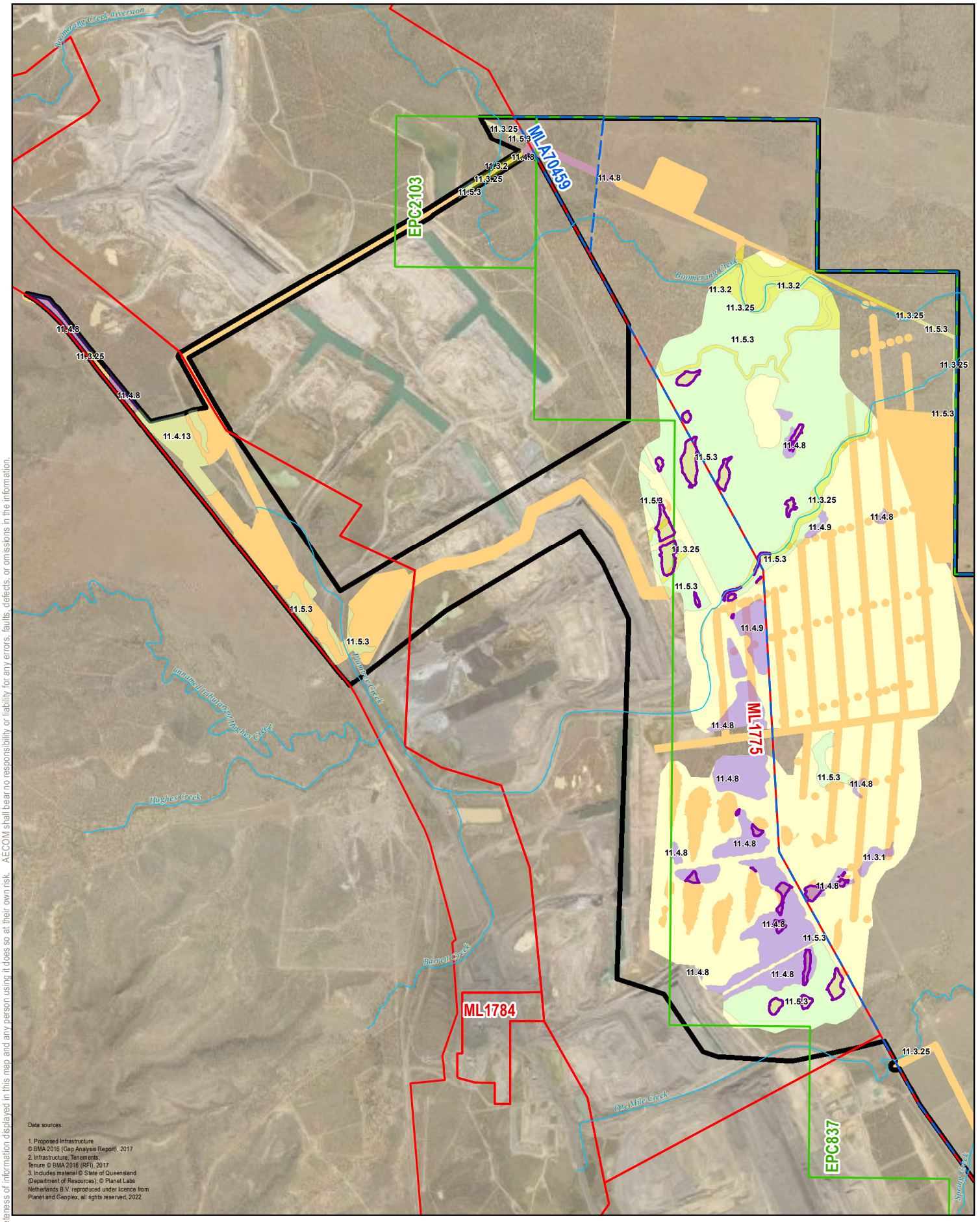
Further discussion of these impacts to vegetation resulting from subsidence are discussed in the following sections.

Table 44 Potential disturbance to vegetation communities during construction

Ground-truthed RE	Status		Project Footprint (ha)	Operational impacts (ha)	
	Biodiversity	VM Act		Maximum extent of ponded areas (ha)	Balance of subsidence (ha)
11.3.1	E	E	6.58	0.00	4.62
11.3.2	OC	OC	65.51	0.00	46.38
11.3.4	OC	OC	0.01	0.00	0.00
11.3.25	OC	LC	73.42	2.94	58.59
11.3.27b	OC	LC	3.04	0.00	0.00
11.4.4	OC	LC	0.075	0.00	0.00
11.4.8	E	E	222.45	12.45	168.79
11.4.9	E	E	32.56	0.09	25.82
11.4.13	OC	LC	38.03	0.00	0.00
11.5.3	NCP	LC	778.66	37.58	682.72
Total				**52.97**	**987.01**

Note 1: Status E – endangered; OC – of concern; LC – least concern; NCP – no concern at present; Non-remnant – non- remnant vegetation; NL – not listed

Note 2: Operation impact areas consisting of indirect impacts from longwall mining. Potential impacts within subsidence areas (outside of areas subject to ephemeral ponding) are likely to be isolated with no likely materialistic change to vegetation present. Areas subject to ephemeral ponding are also co-located within areas of modelled subsidence.



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
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- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Watercourse

Operational Impacts Intersecting Flora Values

- Maximum extent of potential ponding

Regional Ecosystem biodiversity status

- Endangered
- Of Concern
- No Concern at Present

N

Figure 29
Potential Operational Impacts on Vegetation Communities

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.25 0.5 1
Kilometres

Scale: 1:60,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Surface cracking

The formation of surface cracks can lead to increased stress on the roots of woody vegetation with potential for localised root shearing. Disturbance of the root ball from surface cracking, mechanical shaking during active subsidence, or ground tilt can lead to the decline in vigour or potential loss of isolated trees and shrubs (Frazier et al., 2010). This has been previously observed in relation to longwall mining activities associated with the Goonyella Riverside Mine, located 30 km north of Moranbah, which resulted in the loss of isolated mature and semi-mature trees (cited in Frazier, 2015).

Other potential impacts to vegetation can include loss of vigour (i.e. health and resilience), resulting in foliar discolouration, partial defoliation or increased susceptibility to pathogenic attack (Coops *et al.* 2004). The effects of these changes are not always immediate, with many native trees species, such as *Eucalyptus* spp., adapted to a variety of extreme environmental conditions, such as fire, drought and flooding (Ives, 1995). Consequently, localised effects on vegetation condition as a result of subsidence, particularly in deep rooted canopy species, can take years to manifest, and may even go unnoticed until coupled with a change in climatic conditions (e.g. drought stress) (NSW Scientific Committee, 2005). As such, subsidence effects associated with gradual changes may not become apparent for several years, potentially more apparent in areas where moisture conditions are more critical, such as riparian corridors (Frazier et al., 2010).

The extent of soil movement and surface cracking can be dependent on the type of soil associated with the subsidence area (Lechner et al., 2016). Lechner et al. (2016) identified Vertosol soils (i.e. cracking clays) naturally form large cracks as a response to changes in moisture content. Cracking clay soils within the Project Site are located in association with REs 11.3.1, 11.4.8, 11.4.9, including areas containing Brigalow TEC, and non-remnant areas containing modified grasslands and shrubby brigalow regrowth. This soil type has a tendency to swell following rainfall events as moisture penetrates the soil profile and shrink during dry periods, creating cracks within the soil surface (Lechner et al., 2016). As such, potential cracking as a result of subsidence may not be observed within these soil types, with cracks being infilled from the crumbling of soils during dry periods or filled when soils swell following rain events (Lechner et al., 2016).

Other soil types like texture contrast soils (e.g. Kurosols, Chromosols and Sodosols) are not as reactive to changes in moisture content, with the potential for cracks to remain for some time after the subsidence event (Lechner et al., 2016). Soils within areas containing RE 11.5.3 are described as containing sandy-loam, duplex soils with varying levels of sodicity (GT Environmental, 2024). A large proportion of this community (89 per cent) are subject to lower levels of subsidence, ranging from 0-1.5 m, with minor areas potentially exhibiting >2m of subsidence.

While vegetation within the modelled subsidence area (excluding deeper depressions subject to ephemeral ponding) may exhibit isolated occurrences of reduced canopy health or tree loss, surface cracking is considered unlikely to result in materialistic impacts to the composition and structure of native vegetation. This is largely attributed to the characteristic of the soils present (e.g. cracking clays), resilience of native species and the extent and depth of likely subsidence. Ongoing monitoring of the occurrence of and effects of surface cracking will be required to identify any potential change in vegetation condition and composition within subsidence areas and to allow appropriate management measures to be implemented.

Changes in surface water drainage characteristics

Areas subject to modelled subsidence may also experience changes in the hydrology and overland flow due to the changes in localised topography. The accumulation of surface water into deeper depressions resulting from the Project may change the quantity of water entering the adjacent waterways. Impacts of subsidence along riparian corridors can also include changes to stream bed and bank profiles, influencing flow patterns within waterways (NSW Department of Planning, 2008). In the short to medium term, impacted watercourses, particularly Hughes Creek, may become more pond-like in nature, with flows potentially restricted and changes in inundation levels along riparian zones.

Water balance modelling undertaken by Engeny (2022), assessed the direction of water flows, storage and overflow potential associated with the ephemeral ponding areas identified by the subsidence modelling. The water balance model incorporated rainfall, evaporation rates, evapotranspiration, surface run-off and seepage to assess the changes in surface flows over the life of the Project (Engeny, 2022). Most of the areas subject to ephemeral ponding, particularly those to the south of Hughes Creek,

overflow into one another using existing drainage channels (Engeny, 2022), which ultimately overflow into Plum Tree Creek, Hughes Creek and One Mile Creek (Engeny, 2022). Without intervention, the assessment identified the areas subject to ephemeral ponding are expected to reduce the annual downstream flow of surface water generated from within the associated catchments. This result does not account for sediment infilling expected to partially/completely infill with sediment and decrease the storage volume of the waterway ponding areas and allow more water to flow downstream resulting in a smaller difference in levels from the 'pre-mining' scenario (Engeny, 2022).

Through a combination of erosion of pillars and the main heading and infilling due to sediment transport, these creek channels are expected to re-establish over time. However, reduced water availability to riparian vegetation may occur as a result of the Project, potentially leading to bank erosion and destabilisation of large trees along these sections of the creeks. Ongoing monitoring and implementation of the Subsidence Management Plan (BMA, 2024b) will assist to address the management and remediation of potential subsidence impacts.

Fauna

Although some habitat areas within the proposed subsidence footprint will have been cleared or fragmented by IMG infrastructure as discussed in Section 9.1.1.2, it is likely that a number of native fauna tolerant to disturbance may still be present. As subsidence occurs, further changes to vegetation and habitats within these areas may occur. These include:

- the loss of habitat trees that provide roosting and nesting habitat as well as food resources
- change in habitat types from the conversion of some areas from grassland or woodland to ponds

These changes are gradual and this may provide opportunity for fauna to move to adjacent areas to the north and east as food and nesting resources in the Project Site are diminished.

Vegetated areas at risk of subsidence impacts include the *Eucalyptus* and/or *Corymbia* Open Woodlands, River Red Gum Riparian Woodlands and Brigalow communities in the remaining vegetated patches situated between the gas drainage wells and associated infrastructure. As detailed in Section 5.2.1, these habitat areas provide important local habitat for a number of species, especially arboreal mammals, including Koala (*Phascolarctos cinereus*) and the Greater Glider (*Petauroides volans*). Brigalow communities including Brigalow or Belah woodland, Dawson gum and brigalow woodland and shrubby brigalow regrowth with gilgai are also potentially subject to subsidence. A summary of the extent of fauna habitat types potentially impacted by subsidence, including areas subject to ephemeral ponding, are provided in Table 45 and depicted in Figure 30. Potential impacts to fauna habitat values are described further in the following sections.

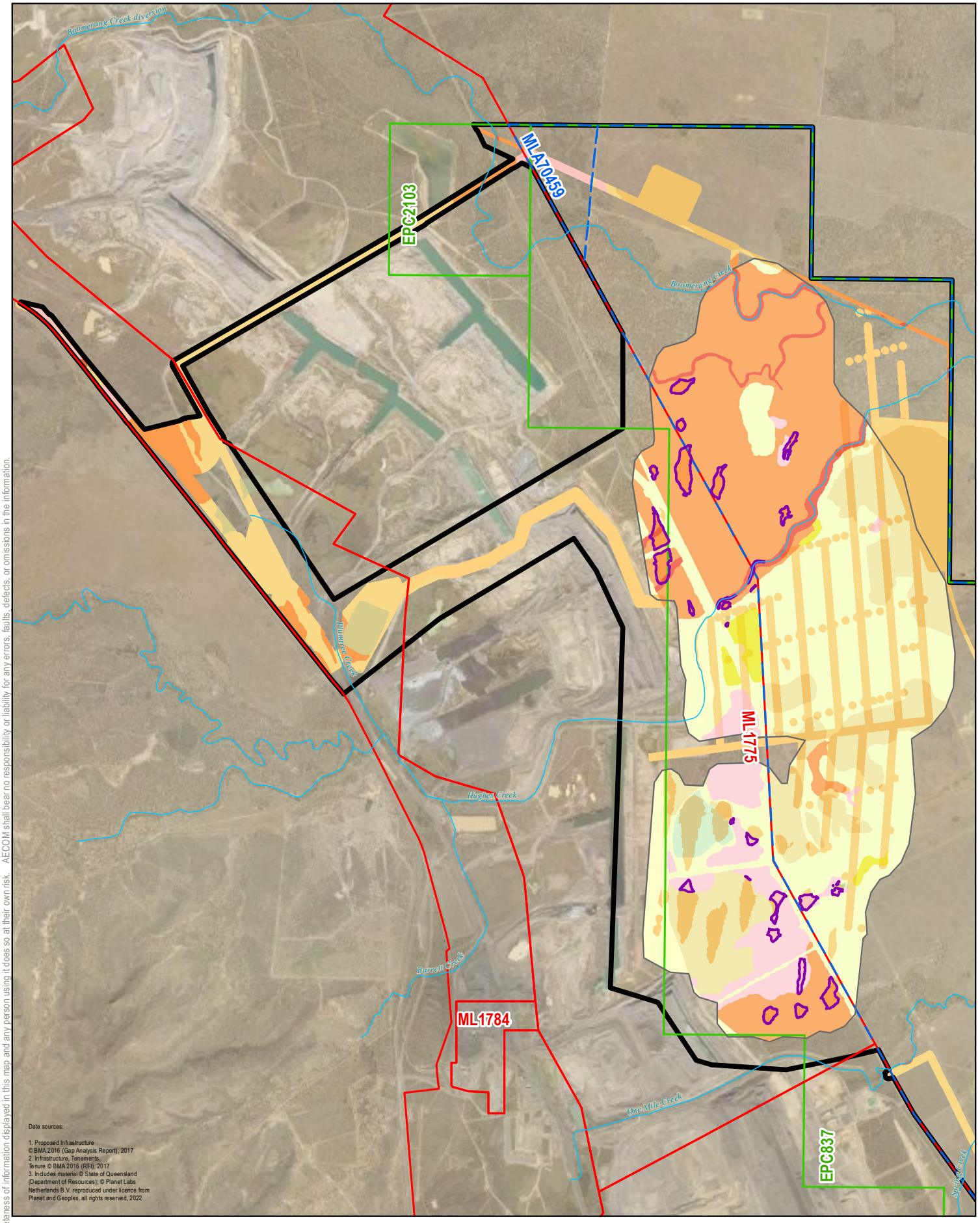
Table 45 Vegetation and fauna habitat potentially subject to ephemeral ponding

Fauna habitat type	RE associations	Project Site (ha)	Project Footprint (ha)	Operation Impacts (ha)[1]	
				Subsidence (ha)[2]	Maximum extent of ponded areas (ha)
River Red Gum Riparian Woodland	RE11.3.25	192.08	73.42	61.52	2.94
Eucalyptus and/or *Corymbia* Open Woodland	RE11.3.2, RE11.3.4, RE11.4.13, RE11.5.3	1,876.30	882.21	766.68	37.58
Dawson Gum and Brigalow Woodland	RE11.4.8	322.35	222.45	181.24	12.45
Brigalow or Belah Woodland	RE11.3.1, RE11.4.9	204.33	39.15	30.53	0.09
Oxbow Wetland	RE11.3.27b	16.64	3.04	-	-

Fauna habitat type	RE associations	Project Site (ha)	Project Footprint (ha)	Operation Impacts (ha)[1]	
				Subsidence (ha)[2]	Maximum extent of ponded areas (ha)
Modified Grasslands	NA	6,418.86	1,420.13	767.42	27.35
Shrubby Brigalow regrowth with gilgai	NA	1,781.99	636.89	350.74	42.33
Dams	NA	107.66	70.72	40.36	22.93
			Total	**2,172.53**	**92.70**

Note 1: Operation impact areas consisting of indirect impacts from longwall mining. Areas subject to ephemeral ponding are also co-located within areas of modelled subsidence.

Note 2: As detailed in Section 9.1.2.1, potential impacts within subsidence areas (outside of ponding areas) are likely to be isolated with no likely materialistic change to vegetation present.



Data sources:

1. Proposed Infrastructure © BMA 2016 (Gap Analysis Report), 2017
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LEGEND

- Project Site
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- Project Footprint - Indirect Impact
- Limit Of Subsidence
- Watercourse

Operational Impacts Intersecting Fauna Habitat

- Maximum extent of potential ponding

Remnant Habitat Types

- River red gum riparian woodland
- Eucalyptus and Corymbia open woodland
- Dawson gum and brigalow woodland
- Brigalow and belah woodland

Non-remnant Habitat Types

- Modified Grasslands
- Shrubby Brigalow Regrowth with Gilgai
- Dams

N

Figure 30
Potential Operational Impacts on Fauna Habitat Values

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.25 0.5 1
Kilometres

Scale: 1:60,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

BMA
BHP Mitsubishi Alliance

DATE: 3/06/2024 VERSION: 2

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Loss of habitat and foraging trees

The formation of surface cracks from subsidence can lead to increased stress and shearing of roots of woody vegetation, potentially leading to the decline in vigour or potential loss of isolated trees (Frazier et al., 2010). The loss of isolated trees can reduce the availability of foraging resources or the loss of habitat features, such as hollows and nests. As previously discussed, impacts to habitat trees from surface cracking are largely located adjacent to the pillars where the slope is greatest and unlikely to be widespread over the mined area. As such, the isolated loss of habitat features on undulating plains and floodplains is unlikely to result in a materialistic change in the habitat values present.

Habitat features associated with riparian corridors, such as along Hughes Creek, may be particularly sensitive to the loss of canopy trees, degrading habitat and reducing the connectivity values for fauna species dependent on these areas. Riparian corridors associated with Hughes Creek, Plumtree Creek and Boomerang Creek includes preferred habitat for the threatened Koala (*Phascolarctos cinereus*) and the Greater Glider (*Petauroides volans*). The loss of multiple trees along these corridors may reduce the ability for fauna, particularly arboreal mammals to disperse to adjacent areas of habitat. In particular, subsidence impacts along Hughes Creek are varied, ranging from 0.5-2 m in depth. The loss of canopy trees from subsidence, in addition to vegetation clearing from the IMG Network, may result in the fragmentation of the riparian corridor. The modelled subsidence impacts to Plumtree and Boomerang Creeks is less, ranging from 0-1 m, with crossings restricted to the transmission and infrastructure corridors (outside of modelled subsidence footprint). As such, impacts to habitat connectivity and dispersal opportunities for fauna species are likely to be reduced.

Ground dwelling fauna are less likely to be affected by subsidence impacts as ground cover is unlikely to be significantly affected. Loss of scattered shade trees may increase ground temperatures which may be problematic for some ground dwelling fauna, although reptiles are not likely to be particularly sensitive to this. Increased exposure of areas caused by vegetation die back may also expose ground dwelling fauna to predation by native and non-native predators.

Generally, bird species are highly mobile and will be able to fly over or through disturbed areas in order to access alternative habitat. Microchiropteran bats will be able to continue to forage over disturbed areas if their roosts remain unaffected.

Progressive rehabilitation of mined areas and implementation of the Subsidence Management Plan will assist in the management and remediation of potential subsidence impacts to fauna habitat.

Change in habitat type

As detailed previously, areas containing deeper depressions may be subject to ephemeral ponding, resulting in changes in the vegetation composition and structure. A number of ponds are likely to be created from subsidence impacts and vary in the period of inundation, with all containing water more than 50 per cent of the time (Engeny, 2022). Where vegetation is intolerant to waterlogging, there is potential for tree die back to occur and, in some areas, be replaced by more tolerant vegetation. This in-turn is likely to impact the habitat values afforded to these areas.

Ponds may create new habitat opportunities for some fauna groups, depending on the potential chemical or physical changes to water and soil. A relatively high diversity of amphibians was recorded in the Project Site and an increase in aquatic habitats may potentially benefit this fauna group in turn increasing food resources for their predators. Cane Toads (*Bufo marinus**) are present, and availability of aquatic habitat may increase their numbers. The availability of permanent water will also benefit larger fauna using the site, including Eastern Grey Kangaroo (*Macropus giganteus*) and pest species such as Feral Pigs (*Sus scrofa**).

Implementation of suitable mitigation measures and monitoring over the duration of the Project will assist in assessing any potential changes in habitat values and manage potential increases in exotic pest fauna.

Groundwater drawdown from water extraction

Assessment of Groundwater Dependent Ecosystems (GDEs) within the Project Site was undertaken by 3d Environmental (2022). Terrestrial GDEs were identified as potentially occurring in association with riparian vegetation along Phillips Creek and Boomerang Creek (3d Environmental, 2022). While similar vegetation (i.e. RE 11.3.25) was observed along Hughes Creek and One Mile Creek, analysis of xylem

stable isotope and soil moisture potential indicates these communities are unlikely to meet the criteria of a terrestrial GDE (3d Environmental, 2022).

Impacts of drawdown in the Tertiary groundwater system may occur within the alluvium where areas of enhanced potential for downward drainage to occur. This is most likely associated with sandy sediments with increased hydraulic conductivity or increased density of preferential flow paths (3d Environmental, 2022). Impacts could also manifest in isolated pockets of groundwater within the Quaternary alluvium, or where seasonal water within the alluvium would have enhanced potential for downward flow due to a lower groundwater level within the underlying Tertiary sediments paths (3d Environmental, 2022). As identified by 3d environmental (2022), the impact of this increased drawdown in the alluvium is predicted to be minor to insignificant to identified terrestrial GDEs as:

- The alluvial groundwater system associated with Phillips Creek and Boomerang Creek are discontinuous along the length of the creek channels and riparian trees are facultative phreatophytes which have capacity to utilise moisture from multiple sources including soil moisture, surface water and groundwater to support transpiration.
- The alluvial groundwater system that supports Terrestrial GDEs on these creeks are recharged by surface flows and flooding which provides the dominant driver to support riparian ecological function.

With implementation of management measures, which includes development of a project Groundwater Dependent Ecosystem Monitoring and Management Plan (GDEMMP), will minimise any potential impacts to terrestrial GDEs identified.

Other indirect impacts

Potential indirect impacts during the operational phase are similar to those described during the construction phase but will primarily relate to activities, maintenance and subsequent vehicle associated with the surface facilities and IMG management infrastructure.

Surface facilities such as the future MIA, CHPP, ROM pad and conveyors are located in areas which are already highly modified. Noise and light from these areas is unlikely to increase impacts on fauna due to lower densities of fauna utilising these areas and due to noise and light impacts from existing operations.

During operation of the IMG management infrastructure there will be some low level noise from the gas wells. However, fauna are expected to habituate to this noise. There will also be some activity and noise from maintenance activities but, as with construction works this will be relatively low impact in terms of noise levels and duration. Fauna present within the mine footprint area are expected to either habituate to the disturbance or move away.

Once operational, traffic to and from the Project will increase, occurring both day and night. As a result, it is anticipated that mortality or injury to fauna will occur. As above, reptiles and macropods are the fauna groups most likely affected. Some birds, such as the Squatter Pigeon (*Geophaps scripta scripta*), the Cumbersome Pheasant Coucal (*Centropus phasianinus*) and raptors feeding on carrion on the road side may also be involved in vehicle collisions.

Elsewhere on the Project Site, internal roads are already formed and occur within disturbed areas. It is anticipated that fauna mortality from vehicle strikes will not significantly increase in these areas.

9.1.3 Decommissioning and rehabilitation

The decommissioning phase will involve the removal of mine infrastructure and rehabilitation of the landform. As such further direct disturbance is not anticipated during this stage or if required, will be temporary in nature.

There is the potential for indirect impacts to occur if the decommissioning process is not managed appropriately. These indirect impacts can include contaminant release from soil or water into the surrounding environment, dust, noise, light, erosion weed and pest proliferation. However, all proposed decommissioning works will be undertaken in accordance with detailed plans and as such these impacts are considered to be low.

As rehabilitation of the post mining land surface is closely connected with subsidence effects, management of ecological impacts from IMG drainage requirements will be closely linked to the overall management approach to subsidence impacts. In particular, it is expected that remnant vegetation that is not directly affected by the IMG management network will become important in terms of ongoing management of subsidence impacts and rehabilitation. A Progressive Rehabilitation and Closure Plan, detailing the post-mining land uses, any non-use management areas and associated milestones, will also be developed for the Project.

9.1.4 Conservation significant flora and fauna

9.1.4.1 Threatened flora and vegetation communities

Regional ecosystems

Conservation significant REs are those with a biodiversity status of, of concern or endangered and those that are analogous with EPBC Act listed TECs. Table 14 lists the nine conservation significant REs that were confirmed within the Project Site during field surveys. Six of these REs will experience direct impacts from the proposed surface activities associated with the construction phase of the Project.

Impacts to REs with an endangered biodiversity status (REs 11.3.1, 11.4.8 and 11.4.9) include direct disturbance up to 62.37 ha, comprising 49.83 ha during construction and 12.53 ha during operation, with the 199.23 ha identified as potential for indirect impacts. Of the 180.09 ha of REs within the Project Footprint with an of concern biodiversity status (REs 11.3.2, 11.3.4, 11.3.25, 11.3.27b, 11.4.4 and 11.4.13), up to 72.19 ha will be directly impacted by construction and up to 2.94 ha of ponded area during operation.

The greatest impact to an individual conservation significant vegetation unit is RE 11.4.8. Potential disturbance to the ERE 11.4.8 of up to 222.46 ha (53.66 ha direct impacts and 168.79 ha indirect impacts) constitutes approximately 1.1 per cent of this vegetation community within the Isaac-Comet Downs subregion. Of concern RE 11.3.25, subject to second largest area of impact of approximately 73.42 ha (14.83 ha direct impacts and 58.59 ha indirect impacts) constitutes 0.2 per cent of this vegetation community found within the Isaac-Comet Downs subregion.

Disturbance to RE 11.3.27b is minimal (3.04 ha); however, the occurrence of this RE within the sub-region is similarly sparse and as such this disturbance equates to approximately 0.3 per cent of this community in the Isaac-Comet Downs subregion. RE 11.5.3, which has a biodiversity status of no concern at present will experience much larger impacts across the site (778.66 ha; 58.36 ha direct impacts and 720.30 ha indirect impacts); however this is much more widely available in the region and as such the impact only constitutes 1.1 per cent of this community in the subregion. The area of potential impacts on all remaining conservation significant REs in context to the extent in which they occur across the subregion is less than 1 per cent.

HVR which is regulated under the VM Act may also be impacted by the Project. A total of 3.98 ha of HVR ERE (RE 11.3.1, 11.4.8 and11.4.9) is mapped within the Project Footprint.

Table 46 Groundtruthed RE impact summary

RE	Status	Project Footprint (ha)	Impact area (ha)				Total area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
11.3.1	E	6.58	0.45	1.51	0.00	4.62	6.58
11.3.2	OC	65.51	16.42	2.70	0.00	46.38	65.51
11.3.25	LC	73.42	6.49	5.41	2.94	58.59	73.42
11.3.27b	LC	3.04	0.00	3.04	0.00	0.00	3.04
11.3.4	OC	0.01	0.01	0.00	0.00	0.00	0.01

RE	Status	Project Footprint (ha)	Impact area (ha)				Total area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
11.4.13	LC	38.03	38.03	0.00	0.00	0.00	38.03
11.4.4	LC	0.08	0.08	0.00	0.00	0.00	0.08
11.4.8	E	222.45	24.33	16.89	12.45	168.79	222.45
11.4.9	E	32.56	0.00	6.66	0.09	25.82	32.56
11.5.3	LC	778.66	34.75	23.61	37.58	682.72	778.66

EPBC Act threatened ecological communities

Within the Project Site, two EPBC Act TECs have been identified. These communities are:

- EPBC Act TEC *Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* (of concern RE 11.4.4)
- EPBC Act TEC *Brigalow (Acacia harpophylla dominant and co-dominant)* (EREs 11.3.1, 11.4.8 and 11.4.9).

Potential impacts to both these TECs often associated with the construction and operational phase of mining projects are associated with both direct disturbances and indirect effects, including:

- vegetation clearing and loss
- fragmentation and edge effects
- weed incursion
- dust
- subsidence
- alterations to hydrological regime, including water quality
- erosion and sedimentation.

Development of mining operations within the Project Footprint will involve direct clearing for surface facilities and ancillary infrastructure as well as direct clearing and fragmentation for IMG drainage network. Ongoing operational impacts may include subsidence due to the development of the Project.

Table 47 TEC impact summary

TEC	EPBC Act Status	Project Footprint (ha)	Impact area (ha)				Total area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	E	0.075	0.075	0.00	0.00	0.00	0.075

TEC	EPBC Act Status	Project Footprint (ha)	Impact area (ha)				Total area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	210.31	19.21	14.71	9.85	166.55	210.31

Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin

Vegetation reflecting the *Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC is located in the Project Footprint, within and adjacent to the transport infrastructure corridor. The area of TEC within the Project Footprint (0.075 ha) are associated with the proposed overhead power line. The overhead power line is expected to span the area of TEC with limited to no clearing required for its construction. As there is unlikely to be above ground disturbance, indirect impacts associated with vegetation clearing such as fragmentation and edge effects, erosion and sedimentation will not occur. In this area, there is low likelihood that vehicle traverses during construction will lead to increased or new weed incursions, excessive dust or the contamination of soils and water. As underground works are located to the north and outside of the mapped extent of this TEC, subsidence impacts are unlikely to affect vegetation conforming to this TEC.

Brigalow (Acacia harpophylla dominant and co-dominant)

A total of 210.24 ha of the *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC falls within the Project Footprint.

The proposed construction village has been located in non-remnant vegetation with vegetation in these areas predominantly low (approximately 1-2 m in height) *Acacia harpophylla* (Brigalow) regrowth. The transport and infrastructure corridor dissect several REs, including *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC conforming areas of RE 11.3.1 and RE 11.4.8. The location of the rail loading balloon loop will also require clearing of RE 11.4.8.

Installation of the IMG drainage network will require clearing of vegetation for the construction of gas wells and corresponding infrastructure including gas pipelines, water pipelines and service roads. The nature of the clearing required will mean that the area will be divided into a grid like pattern. Vegetation conforming to *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC in the form of RE 11.4.8 will experience some clearing for the network, which may facilitate additional fragmentation of small areas of *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC. Fragmentation will also likely have an impact through the potential for weed incursion. *Cenchrus ciliaris** (Buffel Grass) is widespread through the Project Footprint and may more readily infiltrate *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC areas fragmented from construction of the mining project.

Dust impacts generated during the construction and operation of the Project may negatively affect vegetation, particularly if excessive levels are sustained over extended periods. Excessive dust on plant foliage can reduce the amount of light penetration on the leaf surface, block and damage stomata, and slow rates of gas exchange and water loss. Diminished ability to photosynthesise due to physical effects may result in reduced growth rates of *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC vegetation and decrease floral vigour and overall community health.

Subsidence may cause a range of additional changes in remaining flora and vegetation communities. Areas of RE 11.4.8 and RE 11.4.9 analogous to *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC occur with the subsidence area and may potentially be subject to subsidence related changes. These changes may include localised changes in topography, tension cracking and altered drainage characteristics. Frazier (2015) assessed the impacts of subsidence from longwall mining on the condition of Brigalow TEC at the Goonyella Riverside and Moranbah North mines. The assessments consisted of a combination of field surveys and remote sensing. Field surveys included

the assessment of the relative condition of communities subject to varying levels of subsidence. Remote sensing was used to generate digital terrain and canopy height models and determine the projected foliage cover. Assessment of impacts to Brigalow TEC found no significant impacts to the condition of Brigalow TECs subject to subsidence. It was noted however, that changes to the water regime, particularly in relation to ephemeral ponding, may impact the condition, structure and composition of these communities. Consequently, while areas of Brigalow TEC located within the subsidence footprint may be more resilient to potential surface cracking, areas of ephemeral ponding within deeper depressions may be more sensitive to impacts resulting from the Project.

Flora species of conservation significance

One significant flora species was recorded within the Project Site; Bluegrass (*Dichanthium setosum*). One additional conservation significant species, King Bluegrass (*Dichanthium queenslandicum*) is considered likely to be present within the Project Site (Section 4.1.5) although not identified in field surveys.

Potential impacts to Bluegrass (*Dichanthium setosum*) and King Bluegrass (*Dichanthium queenslandicum*) often associated with the construction and operational phase of mining projects are associated with both direct and indirect impacts, including:

- vegetation clearing and loss
- fragmentation and edge effects
- weed incursion
- dust
- alterations to hydrological regime, including water quality
- erosion and sedimentation.

Habitat for these species is located in the Project Footprint, within and adjacent to the transport infrastructure corridor where an overhead powerline will be constructed. Approximately 0.075 ha of potential habitat is mapped within the Project Footprint based on overlapping infrastructure, however the proposed overhead powerline is expected to span overhead with limited to no clearing required for its construction. With limited to no ground disturbance required, indirect impacts associated with vegetation clearing such as fragmentation and edge effects, erosion and sedimentation will also be limited. In this area, there is low likelihood that vehicle traverses during construction will lead to increased or new weed incursions, excessive dust or the contamination of soils and water. As underground works are occurring to the north of this TEC, subsidence impacts are unlikely to affect Bluegrass (*Dichanthium setosum*) and King Bluegrass (*Dichanthium queenslandicum*).

Table 48 Threatened flora impact summary

TEC	EPBC Act Status	Project Footprint (ha)	Impact area (ha)				Total area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
Bluegrass	E	0.075	0.075	0.00	0.00	0.00	0.075
King bluegrass	E	0.075	0.075	0.00	0.00	0.00	0.075

9.1.4.2 Threatened fauna

A number of fauna species of conservation significance were identified from the literature review and field surveys as occurring or likely to occur within the Project Site (Section 9.1.4.2). These species and their likelihood of presence are presented in Table 22. Comments on potential impacts to these species are provided below and impact areas summarised for each species in Table 49. Potential significant impacts have been assessed in Section 11.0.

Squatter Pigeon (*Geophaps scripta scripta*)

A total of 1,862.33 ha of potential habitat for this species is mapped within the Project Footprint. This includes 631.24 ha of preferred habitat, 289.87 ha of suitable habitat and 941.22 ha of marginal habitat. The potential impacts on the Squatter Pigeon (*Geophaps scripta scripta*) include habitat loss and/or fragmentation and direct mortality from vehicle strike or destruction of nests.

Ornamental Snake (*Denisonia maculata*)

A total of 886.02 ha of suitable habitat for this species is mapped within the Project Footprint. Project related impacts on the Ornamental Snake (*Denisonia maculata*) may arise from habitat loss due to clearing, mortality or injury during vegetation clearing, subsidence and from vehicle traffic. Although subsidence is likely to alter habitat for this species, it is expected that much of this habitat will still retain habitat functionality for this species. This habitat alteration may result in the creation of subsidence ponds which may benefit prey populations (Frogs) within the area. However, increased pooling would also support other pest species such as Feral Pigs (*Sus scrofa**) and Cane Toads (*Bufo marinus**). Destruction of wetland habitat by Feral Pigs (*Sus scrofa**) and lethal toxic ingestion of Cane Toads (*Bufo marinus**) have been identified as threats to Ornamental Snake (*Denisonia maculata*).

Australian Painted Snipe (*Rostratula australis*)

A total of 712.97 ha of suitable habitat is mapped for Australian Painted Snipe (*Rostratula australis*) within the Project Footprint. This habitat lacks the required microhabitat features to provide breeding habitat for this species. The species is likely to be a vagrant visitor only and may use wetlands in the Project Site on passage to more suitable breeding or foraging grounds. Based on the lack of preferred habitat for this species within the Project Footprint, it's highly mobile nature and the availability of suitable habitat within the region, Project related impacted are expected to be minimal.

Koala (*Phascolarctos cinereus*)

A total of 1,160.17 ha of potential habitat for Koala (*Phascolarctos cinereus*) is mapped within the Project Footprint. This includes 140.93 ha of preferred habitat, 930.17 ha of suitable habitat and 89.07 ha of marginal habitat. Koalas (*Phascolarctos cinereus*) are likely to be present in low densities and may experience the following impacts:

- loss and fragmentation of habitat
- mortality or injury during vegetation clearing and vehicle strikes
- increased predation risk by domesticated and wild dogs.

A fragmented landscape will result in Koalas (*Phascolarctos cinereus*) being required to travel on the ground in order to traverse between habitats. This will increase their risk from predators such as wild dogs and increase the potential for mortality from vehicle strikes. Mortality during vegetation clearing may also occur. However, the use of mitigation measures such as fauna spotter-catchers will assist in reducing impacts during clearing of potential Koala (*Phascolarctos cinereus*) habitat.

While Koala (*Phascolarctos cinereus*) will be able to move away from the progressive disturbance arising from the IMG management infrastructure, the overall fragmentation, loss of habitat and disturbance may make their continued presence untenable across much of the Project Footprint.

Greater Glider (*Petauroides volans*)

A total of 748.13 ha of potential habitat for Greater Glider (Phascolarctos cinereus) is mapped within the Project Footprint. This includes 72.28 ha of preferred habitat, 195.22 ha of suitable habitat and 480.63 ha of marginal habitat. Potential impacts to Greater Glider (*Petauroides volans*) include the loss and/or fragmentation of habitat. Fragmentation will occur at creek crossings for the transport and infrastructure corridor and powerline connection and within the IMG drainage network. This may locally restrict movement of the species, particularly where the clearing impact width exceeds the volplane distance of the species (greater than 100 m). Given the availability of similar habitat in the region, the expected clearing impact will not typically exceed 100 m.

Indirect impacts as a result of subsidence, particularly along Hughes Creek, may include localised dieback of denning trees or canopy trees that provide habitat connectivity. Alteration of stream flows may also impact on the health of riparian vegetation and Greater Glider (*Petauroides volans*) habitat.

Increased noise and light, particularly during construction, may also impact on breeding, foraging and dispersal behaviours of the species.

Grey Falcon (*Falco hypoleucos*)

A total of 3,113.57 ha of potential habitat for Grey Falcon (*Falco hypoleucos*) is mapped within the Project Footprint. This includes 76.48 ha of preferred habitat, 961.71 ha of suitable habitat and 2,075.39 ha of marginal habitat. This species inhabits woodland, shrubland and grassland in arid and semi-arid zones with a preference for wooded riparian habitats. Habitat is widely available for this species throughout the Project Site and the wider region.

Short-beaked Echidna (*Tachyglossus aculeatus*)

A total of 3,113.57 ha of potential habitat for this species is mapped within the Project Footprint. This includes 1,854.87 ha of suitable habitat and 1,258.70 ha of marginal habitat. This species has a wide distribution in Australia and can tolerate a broad range of habitats. Habitat for this species includes remnant vegetation throughout the Project Site and can also persist in natural or modified grasslands and regrowth, provided that a suitable food source is available. This species is widespread in the area and is a habitat generalist. As such the impacts to this species should be minimal.

Table 49 Threatened fauna impact summary

Threatened fauna	Habitat	Project Footprint (ha)	Impact area (ha)				Total impact area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
Squatter Pigeon	**Total**	**1,862.34**	**316.57**	**155.04**	**95.38**	**1,295.34**	**1,862.33**
	Preferred	631.24	38.90	33.34	12.22	546.78	631.2
	Suitable	289.87	19.24	1.42	28.30	240.92	289.8
	Marginal	941.22	258.43	120.28	54.86	507.64	941.21
Ornamental Snake	**Total**	**886.02**	**213.40**	**121.81**	**54.22**	**496.58**	**886.02**
	Preferred	0.00	0.00	0.00	0.00	0.00	0.00
	Suitable	886.02	213.40	121.81	54.22	496.58	886.02
	Marginal	0.00	0.00	0.00	0.00	0.00	0.00
Australian-painted Snipe	**Total**	**712.97**	**218.98**	**102.89**	**65.26**	**325.85**	**712.97**
	Preferred	0.00	0.00	0.00	0.00	0.00	0.00
	Suitable	712.97	218.98	102.89	65.26	325.85	712.97
	Marginal	0.00	0.00	0.00	0.00	0.00	0.00
Koala	**Total**	**1,160.17**	**95.77**	**51.49**	**52.33**	**960.58**	**1,160.17**
	Preferred	140.93	21.87	11.15	2.94	104.97	140.93
	Suitable	930.17	15.00	35.98	49.40	829.79	930.17
	Marginal	89.067	58.89	4.36	0.00	25.81	89.07
Greater Glider	**Total**	**748.13**	**34.45**	**33.36**	**20.60**	**659.71**	**748.13**
	Preferred	72.28	5.22	5.41	0.94	60.72	72.28
	Suitable	195.22	16.62	7.26	3.11	168.23	195.22
	Marginal	480.63	12.62	20.69	16.55	430.77	480.63
Grey Falcon	**Total**	**3,113.58**	**692.96**	**348.46**	**116.32**	**1,955.83**	**3,113.58**
	Preferred	76.48	6.50	8.45	2.94	58.59	76.78

Threatened fauna	Habitat	Project Footprint (ha)	Impact area (ha)				Total impact area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
	Suitable	961.70	229.83	122.98	54.86	554.03	961.70
	Marginal	2,075.39	456.63	217.02	58.52	1,343.21	2,075.39
Short-beaked Echidna	**Total**	**3,113.58**	**538.89**	**348.46**	**116.32**	**1,955.84**	**2,959.51**
	Preferred	0.00	0.00	0.00	0.00	0.00	0.00
	Suitable	1,854.87	155.04	155.04	95.38	1295.34	1,700.80
	Marginal	1,258.71	383.85	193.42	20.94	660.50	1258.71

9.1.4.3 Migratory

Latham's Snipe (*Gallinago hardwickii*)

The preferred habitat for Latham's Snipe (*Gallinago hardwickii*) is permanent and ephemeral wetlands of which small areas are available associated with RE 11.3.27b. Watercourses such as Phillips Creek and Boomerang Creek, ephemeral wetlands following heavy rain and artificial dams may provide temporary stopover opportunities during dispersal to preferred habitat. It is possible that disturbance adjacent to wetlands within the Project Site may deter the species from utilising the habitat. However, impacts from the Project to this species in a regional context are considered minimal.

White-throated Needletail (*Hirundapus caudacutus*)

This species breeds in northern Asia and migrates to Australia during early October (DoEE, 2017d). The White-throated Needletail (*Hirundapus caudacutus*) occupies open spaces of sky over almost any habitat. This species is not expected to suffer from habitat loss impacts.

Fork-tailed swift (*Apus pacificus*)

The Fork-tailed Swift (*Apus pacificus*) is a non-breeding migrant to Australia and exclusively aerial, spending day and night on the wing. This species flies above a wide range of habitats and may potentially occur in the airspace across the Project Site but is not associated with particular habitat types. Similarly to the White-throated Needletail (*Hirundapus caudacutus*), this species is not expected to suffer from habitat loss impacts.

Caspian tern (*Hydroprogne caspia*)

Suitable habitat for this species within the Project Site includes dams and wetlands. This species has a widespread occurrence in both coastal and inland habitats. The Project is not expected to result in significant habitat loss for the species.

9.2 Potential impact on ESAs

Section 6.0 detailed the ESAs within the Project Site and surrounding region. Except where ESAs may occur downstream of the Project Site, ESAs more than 100 km from the Project Site have been excluded from further consideration. Described below are the potential impacts of the Project on ESAs.

9.2.1 Overview of impacts

Three Category B ESAs were identified as occurring within the Project Site, while additional ESAs were identified as occurring downstream of the Project. Table 50 below details these ESAs and the likelihood that the Project may potentially impact them.

Table 50 Likelihood of Impact on ESAs from the Project

ESA	Classification	Likelihood of impact	Potential impact
National Parks	Category A	**Nil**. Impacts on national parks are considered unlikely due to distance from the Project Site and lack of connective vegetation.	Nil
Conservation Park	Category A	**Nil.** Impacts on conservation parks are considered unlikely due to distance from the Project Site and lack of connective vegetation.	Nil
Great Barrier Reef Marine Park	Category A	**Unlikely**. The Fitzroy River discharges to the GBRMP 490 km downstream of the Project Site. Water quality impacts are not likely to be detectable.	Nil
World Heritage Areas	Category B	**Unlikely**. The Fitzroy River discharges to the GBRWHA 490 km downstream of the Project Site. Water quality impacts are not likely to be detectable	Nil
Endangered Regional Ecosystems	Category B	**Confirmed**. Three ERE comprising 261.60 ha exists within the Project Footprint with potential to be directly impacted by surface infrastructure/IMG (49.84 ha) and ponding areas (12.53 ha) with 211.75 ha potentially attributed to indirect impacts.	Direct and indirect
Places of Cultural or Aboriginal Heritage Significance	Category B	**Unlikely.** There are known Aboriginal cultural heritage sites within the Project Site which includes a combination of recorded places and sites identified during exploration works. This EIS assumed that any Project impacts to Aboriginal cultural heritage will be identified and managed under the existing Cultural Heritage Management Plan (CHMP) between BMA and the Aboriginal Party (CLH012020).	Nil
Nature Refuges	Category C	**Unlikely** due to distance from the Project Site and lack of connective vegetation.	Nil
Resource Reserves	Category C	**Unlikely** due to distance from the Project Site and lack of connective vegetation.	Nil
State Forests	Category C	**Unlikely** due to distance from the Project Site and lack of connective vegetation.	Nil
General Use Zones of a Marine Park	Category C	**Unlikely**. The Fitzroy River discharges to the GBRWMP 490 km downstream of the Project Site. Water quality impacts are not likely to be detectable Further discussion provided in Surface Water Technical Report (AECOM, 2024).	Nil

It is considered that national parks, conservation parks, nature refuges, resource reserves and State forests will not be impacted by the Project due to the distance of these areas from the Project Site and the lack of connectivity in relation to wildlife movement.

9.2.2 ESAs within the Project Site

As noted in above, three Category B ESAs occur within the Project Site will be potentially impacted by the Project (totalling 261.60 ha including 49.84 ha attributed to direct impacts and 211.75 ha attributed to indirect impacts). Figure 22 to Figure 24 depicts the Project Footprint and the location of each ESA situated within the Project Site. The potential impacts on these ESAs have been discussed previously within the flora and fauna component of the report (Section 9.1.1, 9.1.2 and 9.1.3).

10.0 Mitigation measures and monitoring

The application of mitigation measures will minimise impacts from the Project on flora, fauna and ESAs. Where impacts are unable to be avoided or mitigated (e.g. clearing of vegetation) offsets may be required. Mitigation measures associated with the potential impacts from each activity are presented below.

10.1 Avoidance

Significant mine engineering design has been undertaken in the development of the Project Footprint. The Project location is defined by the nature and scale of the coal deposit. As such, it is constrained by resource, geographic, existing infrastructure and feasibility considerations. While an alternative option to not proceed with the Project avoids potential environmental impacts, it will also result in substantial socio-economic impacts, including:

- loss of economic benefit
- reduced local, State and nationwide job opportunities
- reduced demand and income for support industries and service suppliers
- resources will not be available to supply high quality coal products to export markets
- missed opportunity for employee opportunities, apprenticeship programs, support of local businesses and financial donations to community groups and local projects.

The finalised layout of the Project aims to optimise mining to access most of the target resource with the smallest footprint to minimise impacts to land, environment, heritage and community values. The Project's target resource is located predominantly in MLA 70383 which is contiguous with leases currently held by BMA for the existing Saraji Mine. The Project location has also been identified to enable an opportunity for strategic growth, as the extent and nature of the resource is well understood due to extensive exploration and historic mining in the area. As such, BMA can bring this Project into production reasonably quickly compared to less well-known resources.

At the proposed location, the Project will intersect Hughes Creek and Boomerang Creek already subject to diversions and impacts of mining upstream, with the benefit of being able to avoid introducing mining impacts to Phillips Creek, Spring Creek and One Mile Creek to the south. An alternate location will result in new impacts and increased disturbance to land and sensitive environmental values as well as key infrastructure being further away from existing infrastructure and mining operations leading to increased disturbance as well as higher development and operational costs in accessing and processing the resource.

The Project will adopt an optimised underground mine plan for the Project to integrate with existing Saraji Mine open cut mine and supporting infrastructure, access dipping coal seams and minimise environmental impacts. A maximised mine plan option, comprising 17 longwalls accessed via the existing open cut, was considered in order to maximise mining of the available coal resource within the mining tenure. This larger underground mining footprint was expected to result in greater surface disturbance, particularly subsidence impacts on associated watercourses, surface water flow and vegetation. As a result of greater environmental impacts and capital costs, this option was not considered the most effective use of the coal resource.

Where possible utilisation of the existing Saraji Mine infrastructure has been incorporated into the Project design to minimise the need for additional disturbance. For example, the management of dewatered tailings will be within the existing Saraji Mine in-pit spoil dumps. As a result, the Project will not require new tailings storages. Similarly, the location of surface infrastructure has determined based on the access to existing Saraji Mine infrastructure including the existing CHPP, BMA's existing water pipeline network, telecommunications network and electrical power network.

The optimised mine plan provides ideal capacity to mine the target resource within the Project Site with consideration of resource geology and quality, production rates, site constraints and potential environmental impacts.

10.2 Minimise

The Project has been designed to utilise existing mine infrastructure and previously disturbed land at Saraji Mine in order to minimise further disturbance and further impact to the environment.

Use of the underground longwall mining methods will also minimise direct impacts to ecological values in comparison to open-cut mining. As discussed in Section 9.1.2.1, while vegetation within the modelled subsidence footprint may be subject to isolated loss of trees attributed to surface cracking, native vegetation is unlikely to result in materialistic change to vegetation composition and structure. Modification of vegetation and habitat present will be largely limited to deeper depressions subject to ephemeral ponding.

Access to the underground working areas will be through a portal developed in the existing open cut highwall on the far eastern side of the existing open cut mining area. This reduces the portal complexity, length and quantity of spoil materials generated compared to an above ground configuration. Locating the portal in the existing open cut also allows for shorter above ground conveyor configuration between the underground mine and CHPP. Use of the existing open cut pit for mine access minimises potential environmental impacts, costs, time and risks involved in construction of a new mine portal from above ground level.

The CHPP, conveyors and product stockpiles are located within the existing Saraji Mine ML and, while vegetation clearing is required, this vegetation is disturbed and fragmented. The proposed MIA and the raw water dam are to be located in a disturbed area within Saraji Mine and are not anticipated to require removal of remnant vegetation.

Clearing for the powerline connection will only be required for footings and a narrow easement. As such, impacts to high biodiversity values within the powerline connection footprint will be minimised. The width of the corridor is also expected to reduce during the detailed design process.

Further detailed design will refine the siting and disturbance associated with surface infrastructure, IMG network, access, pipelines and powerlines, ensuring where disturbance is required, it will be restricted to the minimum necessary. While design of the layout of the IMG drainage infrastructure has not yet been finalised, it is intended to restrict the number of times that the infrastructure crosses these creeks to minimise direct disturbance to this corridor. Wherever possible, the wells required for IMG drainage will be installed outside of the riparian zone. Required crossings will be selected where natural breaks in vegetation occur where practical. Some pipeline crossings will be required and these will be trenched crossings, with disturbed areas reinstated to stabilise the river bed and banks. The required crossings will be reduced to the minimal width required.

10.3 Mitigation

10.3.1 Mitigation measures specific to surface facilities and infrastructure

10.3.1.1 Flora and vegetation communities

When clearing vegetation for any of the surface facilities, the following mitigation measures will be implemented:

- areas for clearing will be clearly delineated to avoid inadvertent clearing
- if habitat trees can be retained without compromising safety, these will be identified and clearly marked
- habitat features such as felled trees and logs will be considered for relocation to other areas where practical to provide microhabitat
- workers will be made aware of mitigation management requirements in induction training.

Throughout construction, the following mitigation measures will be utilised to manage impacts from construction activities:

- topsoil will be removed and used to rehabilitate existing disturbed areas in accordance with the EA and Regional Interests Development Approval

- erosion and sediment control measures will be installed and maintained to Australian Standards and in accordance with the EA
- dust suppression measures will be utilised to minimise deposition of dust on adjacent vegetation
- bushfire risk during construction activities will be mitigated through the following measures:
  - managing vegetation within the MLAs to maintain safe fuel loads
  - any chemicals used in the Project Site will be handled and disposed of in accordance with the relevant Safety Data Sheet
  - implementing access tracks, to be used by Queensland Fire and Rescue Service for emergency purposes; and
  - implementing an Emergency Response Procedure prepared in consultation with emergency services.

Weed monitoring and management will be ongoing throughout construction and operation.

As it will not be possible to avoid impacts on vegetation communities of conservation significance, offsets may be required to mitigate residual impacts. Offsets are discussed further in Section 10.4.2.

10.3.1.2 Fauna

Measures set out above to minimise impacts on flora and vegetation communities will also assist to some extent in minimising impacts on fauna. Other measures which will be implemented include:

- the workforce will be provided with contact details of suitably qualified spotter catchers in the event that fauna is present and needs to be removed, or fauna are accidentally injured. This will be covered in induction training and work instructions
- heavy vehicles (and where practical, light vehicles) will not traverse vegetated areas outside designated construction zones, and will be required to remain on existing tracks
- during detailed design, lighting will be designed so that light spill into adjacent habitat areas is minimised.

Suitably qualified spotter catchers will be required during vegetation clearing (all spotter catchers will hold appropriate permits under the NC Act). If fauna are injured by vehicles during operations, the RSPCA or local wildlife carers will be contacted for assistance.

10.3.2 Mitigation measures specific to the gas drainage network

10.3.2.1 Flora and vegetation communities

While the extent of infrastructure required for IMG drainage will mean that impacts on significant vegetation communities and plants are unavoidable, there are a range of measures that will be taken to potentially reduce the level of impact of clearing and manage associated impacts. These include the following:

- avoiding placement of IMG extraction wells and infrastructure within EREs; RE 11.3.1, RE 11.4.8 and RE 11.4.9 where practical. Where unavoidable, offsets will be sourced
- designing and constructing IMG management infrastructure to minimise disturbance to riparian zones along the Boomerang Creek, Plumtree Creek, Hughes Creek and oxbow wetlands and avoiding placement of wells within 50 m of these waterways wherever possible
- wherever practical, locating infrastructure alignments and gas drainage wells to avoid remnant vegetation
- minimise creek crossings
- selecting river and creek crossings where natural breaks in vegetation occur where practical
- areas where clearing is planned should be distinctly delineated, so that inadvertent clearing of additional areas does not occur
- before being brought onsite, all vehicles and equipment should be cleaned to remove weed seeds

- dust suppression measures will be undertaken to minimise dust deposition on vegetation adjacent to tracks and construction areas
- management measures to remove and control any new weed infestations or areas that have exhibited increased densities and/or extents within disturbance areas, including vegetation fragmented by the IMG Network
- utilising erosion and sediment control measures as set out in Australian Standards and the EA for all ground disturbance activities and stream crossings.

10.3.2.2 Fauna

The primary impacts on fauna during construction of the IMG drainage network are the loss of habitat and potential risk of mortality associated with the works. Measures to reduce habitat impacts will include:

- selecting already disturbed areas for crossings of creeks and drainage lines where practical
- minimising the width of clearing required for crossing, and particularly retaining tall trees on either side of crossing locations wherever this is safe to do so
- minimising placement of gas wells in riparian and woodland areas wherever possible.

Suitably qualified spotter catchers will be required during all clearing activities. Spotter catchers will hold appropriate permits under the NC Act. When working remote to the spotter catchers, workers will be provided with contact details for the spotter/catchers in the event that fauna is present and needs to be removed, or are accidentally injured. This will be covered in the induction training and work instructions.

Vehicles will not be allowed to traverse vegetated areas but will be required to remain on existing tracks. Speed limits will be placed on all roads and tracks associated with the IMG drainage network.

As potential animal breeding places are present within the Project Site, a Species Management Program (SMP) will be obtained for the Project for approval to tamper with animal breeding places (e.g. nests and hollow bearing trees), as required under Section 335 of the NC (Animal) Regulation. As breeding places for least concern species, least concern colonial breeders and wildlife prescribed as threatened under the NC (Animal) Regulation (i.e. Greater Glider (*Petauroides volans*)) are likely to be present within the Project Footprint, a High Risk SMP will be required.

Where lighting is required, lighting will be directed away from vegetated areas where practical.

10.3.3 Mitigation measures specific to subsidence

A subsidence monitoring program and adaptive management approach will be implemented to manage potential subsidence impacts to vegetation and habitat from the Project and will be documented within associated monitoring reporting. In the event potential subsidence impacts are identified within the modelled subsidence extents and/or environmental consequences occur, further assessment will be undertaken to identify the extent and potential cause of the changes in vegetation/habitat condition.

Adaptive management will involve implementation of measures to prevent re-occurrence. The extent of direct impacts of subsidence on flora and vegetation communities will be mitigated through monitoring to identify persistent ponding in the landscape, with minor remedial drainage works to ensure free-draining landform. Erosion and surface cracking will also be repaired. Further information is presented in the Subsidence Management Plan (BMA, 2024b).

Where machinery is required to repair surface cracks or construct subsidence pond drainage channels, vehicles and equipment will be cleaned of all weed seeds and other potential contaminants before entering the site. Progressive rehabilitation will be undertaken as detailed in the Rehabilitation Management Plan (BMA, 2024a). Priority will be given to restoring the habitat connectivity associated with riparian wildlife corridors. Rehabilitation of subsidence impacts will include:

- post subsidence inspections and identification of high risk areas, drainage works (to promote drainage and pump areas of persistent ponding
- rehabilitate with species similar to native vegetation of the region that are tolerant of inundation

- installation of interim control devices to divert surface runoff away from rehabilitated areas, if assessed as necessary, until groundcover is established
- remediation of prolonged surface cracking (greater than 12 months) (ripping, grading, compaction or crack infilling), particularly along ephemeral drainage lines.

10.4 Management and monitoring

A number of specific management plans will be prepared to address specific impacts and outline mitigation measures to be implemented during the construction and operational phase of the project. This includes:

- Weed and Pest Management Plan (construction phase only)
- Rehabilitation Plan (construction and operational phase), draft to be provided with EIS submission
- Topsoil Management Plan (construction and operational phase)
- High Risk Species Management Plan (construction phase only) for threatened fauna, colonial breeding species and NC Act-listed Special Least Concern (non-migratory) species
- Subsidence Management Plan, including vegetation health monitoring (operational phase)
- Offset Management Plan (operational phase)
- Groundwater Dependent Ecosystem Monitoring and Management Plan (operational phase).

An overarching Construction Environmental Management Plan (CEMP) will also be prepared to mitigation and manage impacts. This plan will be developed to outline and describe the following:

- objectives
- risk assessment
- environmental management activities and mitigation measures
- the timing of actions
- a monitoring program, which will include:
    - performance indicators (clear and concise criteria against which achievement of outcomes are to the measured), which are capable of accurate and reliable measurement
    - outcomes (time bound outcomes as measured by performance indicators), which might include milestones (interim outcomes)
    - monitoring requirements (timing and frequency of monitoring to detect changes in the performance indicators, to determine if outcomes are being achieved, and to inform adaptive management)
    - trigger values for corrective actions.
- potential corrective actions to be implemented if trigger values are reached, and how environmental incidents and emergencies will be managed
- roles and responsibilities (clearly stating who is responsible for activities)
- monitoring for impacts related to subsidence will be undertaken

Monitoring of retained vegetation areas will be undertaken throughout the life of the Project. As the subsidence ultimately changes the hydrology of the area, a floristic change will naturally occur over time in areas of retained vegetation. Monitoring will need to focus on whether this change can occur naturally through regrowth of native vegetation from seed stock, or whether intervention is required to replace plants that die at a greater rate than natural reestablishment.

Remnant vegetation will be monitored for foliar discolouration, partial defoliation, increased pathogenic attack, or tree death as signs of vegetation impacts from subsidence. Tree deaths and regrowth in

areas affected by subsidence will be monitored to assess whether rehabilitation is required. In areas where natural regrowth is not sufficient to replace dead trees, replanting will be undertaken.

10.4.1 Weed and pest management plan

The Weed and Pest Management Plan will detail specific management measures for construction, operation and rehabilitation in accordance with BMA weed management and mitigation guidelines, recommended Biosecurity Queensland (BQ) methods (Department of Agriculture and Fisheries 2020) and the Isaac Regional Council Biosecurity Plan 2020-2023 management for species highlighted in Section 4.2.6 and 5.2.4.

Control measures that will be outlined within the Plan include:

- management measures to remove and control any new weed infestations or areas that have exhibited increased densities and/or extents within disturbance areas, including vegetation fragmented by the IMG Network
- containment and treatment measures including:
    - managing pests and weeds through documented procedures on new infestations, consultation with stakeholders prior to implementation and removal in accordance with Local Government measures
    - prioritising control programs based on risk levels
    - containing the spread of weeds through best practise controls
    - monitoring for response to controls or future control methods

The Weed and Pest Management Plan will cover construction, operation and rehabilitation periods and will include:

- requirement for all staff will undergo a site-specific induction including the identification, prevention, minimisation and management requirements of weed and pest species on-site
- maps showing distribution and abundance of weeds
- management methods to control spread of weed species (in particular *Parthenium hysterophorus**), in keeping with regional management practice or Queensland Department of Agriculture and Fisheries pest control prescriptions
- ongoing monitoring of the Project Site to identify any new incidence of weed infestation or areas that have exhibited increased densities and/or extents within disturbance areas
- provision of information for project staff on the identification of WoNS, Restricted Matter weed species and Priority Weed Species and their dispersal methods
- vehicle hygiene, including:
    - all vehicles, machinery and equipment accessing landowner properties should be inspected and declared ‘weed free’ prior to entering
    - no vehicles are to drive over topsoil stockpiles
    - vehicles are to remain on existing access tracks and avoid driving over weed populations
- all rehabilitation materials (e.g. seed, mulch) brought to site should be declared free of weed material and recorded in the site’s document management system
- movement of materials, such as sand, gravel, rock, soil and organic matter, must be controlled to ensure that it does not result in contamination by weed seeds or material
- all reasonable efforts should be made to limit the application of topsoil containing weed seeds or material
- methods for weed eradication from the site in accordance with local management practice from the IRC and/or the Queensland Government Pest Fact sheets. Any weed material removed will be appropriately disposed of.

- promotion of awareness of weed management, by inclusion of weed issues, pictures and procedures into the Project's site induction program.

Details of weed and pest monitoring will be outlined in the Weed and Pest Management Plan. As described in Section 4.2.6, occurrences of pest flora species currently occur across the Project Site, likely attributed to current and historical land use practices (e.g. grazing). Biosecurity monitoring will seek to assess existing population densities and extents as well as any new introductions/infestations along disturbance areas (i.e. access tracks, infrastructure, rehabilitation areas and topsoil stockpiles, etc.). Monitoring will occur throughout the life of the Project to ensure their ongoing effectiveness. Any significant findings, such as new pest or weeds species, new outbreaks or any actions resulting from Project activities will be incorporated into a review of the Weed and Pest Management Plan. This will allow the Weed and Pest Management Plan to be adapted if performance criteria are not met.

The monitoring program will include:

- pre-clearance surveys within and directly adjacent to the Project Footprint to record presence and abundance of invasive weeds and pests and to identify weed hot spots
- a schedule and details of methods and data collected during construction audits and ecological condition monitoring in retained vegetation adjacent to the Project Footprint
- details of how results from these monitoring activities may trigger corrective actions
- details of the corrective actions which will be triggered when predetermined weed/pest thresholds are exceeded. These will include but not be limited to:
    - treatment of new weed incursions
    - monitoring of success and treatment
    - review of site procedures for weed management
    - rehabilitate and stabilise disturbed non-operational areas
    - re-educate / train site personnel on management requirements, practices and site rules
    - develop a species specific control program for pest fauna where require and review as necessary to ensure it remains effective and applicable.
- monitoring for pest plants and fauna within subsided areas where ephemeral ponding occurs will be undertaken to determine the need for specific management measures
- the monitoring will be undertaken in accordance with QLD State and federal survey guidelines for monitoring weed and pest species.

10.4.2 Rehabilitation

BMA has prepared a Rehabilitation Management Plan (BMA, 2024a) in line with the Mined Land Rehabilitation Policy (DES, 2018). In accordance with the policy, land will be rehabilitated to achieve the following rehabilitation goals:

- safe to humans and wildlife
- non-polluting and does not cause environmental harm
- stable
- able to sustain an agreed post mining land use.

BHP's Queensland Coal Rehabilitation Completion Criteria outlines the completion criteria for meeting satisfactory rehabilitation for a number of post mining land uses. Post mining land uses may include:

- cattle grazing
- dryland cropping
- woodlands habitat
- watercourses

- water storage.

The completion criteria set out objectives, indicators and criteria for achieving acceptable rehabilitation in the post mining land uses. The completion criteria consider goals of safety, stability, minimal pollution and the ability to sustain an agreed post mining land use. **Chapter 5 Land Resources** (BMA, 2024) of the EIS presents these completion criteria and rehabilitation goals in further detail.

The proposed post mining land use will be an undulating landscape that could be used as grazing land, consistent with the surrounding pastoral land use that dominates the region. Native vegetation outside of the surface infrastructure footprint will be retained in a way that is compatible with the pre-existing land use for biodiversity values. However, where vegetation mortality occurs as result of persistent ponding, associated with subsidence, it will be revegetated with species that are tolerant of inundation. There may be instances in which a mix of native and non-native species will be implemented.

10.4.3 Bushfire Risk Management

Much of the Project Site is mapped under the State Planning Policy interactive Mapping as comprising Medium Potential Bushfire Intensity.

Bushfire hazard and risk management including:

- Use of firebreaks along the mine lease boundary and providing adequate setbacks between infrastructure and hazardous vegetation allowing access for fire-fighting and other emergency vehicles and maintaining access tracks to permit safe evacuation
- Fuel reduction (e.g. slashing and woody vegetation control) within firebreaks
- Implementing an Emergency Response Procedure prepared in consultation with emergency services.

11.0 Significant Impacts and offsets

11.1 Commonwealth Significant Impact Assessment

For MNES with the potential to be impacted by the Project, the significance of these potential impacts has been assessed against the *EPBC Act Significant Impact Guidelines 1.1* (DotE, 2013). A detailed review of MNES including the outcome of impact assessment is provided as a standalone chapter in this EIS (refer to **Chapter 21 Matters of National Environmental Significance** (BMA, 2024)).

11.2 State Significant Impact Assessment

As discussed in Section 8.0, the following MSES that relate to terrestrial ecology are found within the Project Site:

- Regulated vegetation:
  - Prescribed REs that are listed Endangered and Of Concern under the VM Act
  - Prescribed REs within a Vegetation Management Wetland area
  - Prescribed REs within the defined distance of a watercourse.
- Protected wildlife habitat:
  - Ornamental Snake (*Denisonia maculata*)
  - Squatter Pigeon (*Geophaps scripta scripta*)
  - Koala (*Phascolarctos cinereus*)
  - Greater Glider (*Petauroides volans*)
  - Australian Painted Snipe (*Rostratula australis*)
  - Grey Falcon (*Falco hypoleucos*)
  - Short-beaked Echidna (*Tachyglossus aculeatus*).
- Connectivity areas
- Waterways providing fish passage.

After all reasonable avoidance and on-site mitigation measures for the Project have been or will be undertaken (Section 10.0), the Project may still impact on MSES. Therefore, the Significant Residual Impact Guideline prepared by the Department of the Environment and Heritage Protection (2014) has been used to determine the significance of the residual impact.

For the purpose of this assessment, the impact areas associated with the Project will Include:

- Construction phase impacts associated with surface facilities, ancillary infrastructure and the IMG Drainage Network; and
- Operational phase impacts associated with deeper depression areas subject to prolonged ponding (materialistic change to vegetation composition and habitat).

As detailed within Section 9.1.2.1, while vegetation within the modelled subsidence footprint may be subject to isolated loss of trees attributed to surface cracking, native vegetation is unlikely to experience a materialistic change to vegetation composition and structure. As such, MSES regulated vegetation within the subsidence footprint (not including areas subject to ponding) has been excluded from the significant impact assessment.

It is important to note that the below assessments are not to be used to determine if the Project requires assessment for potential impacts on MNES protected by the Commonwealth EPBC Act or if an offset would be required under that Act.

Regulated Vegetation

As detailed in Section 8.0, field-verified RE mapping has been ratified by the Queensland Herbarium. The assessment of MSES Regulated Vegetation has been calculated based on the Ground-Truthed Regional Ecosystem mapping.

Impacts to State-mapped Regulated Vegetation which contains a prescribed regional ecosystem are assessed in three ways under the Significant Residual Impact Guideline (Department of the Environment and Heritage Protection, 2014):

- impacts to REs listed as 'Endangered' or 'Of Concern' under the VM Act
- impacts to REs that intersects an area shown on the Vegetation Management Wetlands map
- impacts to REs within the defined distance of a watercourse defined under the VM Act.

To complete these assessments, three main criteria are utilised.

- **Criteria 1** is detailed in Table 51 below and is the only criteria relevant to each three assessments of regulated vegetation.

Table 51 Impact thresholds per RE structure

RE Structure Category	Impact Area Threshold (ha)
Dense and mid-dense[1]	0.5
Sparse and very sparse[1]	2
Grassland[1]	5

[1] Refer to the structure category within the REDD

- **Criteria 2** is "will clearing occur within 50 m of the defining bank", and is relevant only to REs that intersect areas on the Vegetation Management Wetlands map.
- **Criteria 3** is "will clearing occur within 5 m of the defining bank", and is relevant only to REs that are within the defined distance of a watercourse defined under the VM Act.

1. Endangered and Of Concern Prescribed Regional Ecosystems

The significant residual impact (SRI) assessment for impacts to Endangered and Of Concern REs is based on criteria one only. If the impact extent for the relevant RE structure categories detailed in Table 51 below is exceeded, a SRI may occur.

Three prescribed REs listed endangered and one RE listed of concern occur within the State-mapped Regulated Vegetation within the impact areas associated with the construction and operational phases of the Project. The total area of remnant vegetation containing Endangered or Of Concern REs that will be impacted by the Project is 81.5 ha. The SRI assessment of endangered and of concern REs is presented in Table 52 and indicates that a SRI is likely.

Table 52 SRI assessment for Endangered and Of Concern REs

RE	Structure Category	Impact Area (ha)			Impact Threshold Exceeded?	SRI Outcome
		Construction	Operation	Total		
Endangered						**Yes**
11.3.1	Mid-dense	1.96	-	1.96	Yes	
11.4.8	Sparse	41.22	12.45	53.67	Yes	
11.4.9	Sparse	6.66	0.09	6.75	Yes	
Of Concern						
11.3.2	Sparse	19.12	-	19.12	Yes	
11.3.4	Sparse	0.01	-	0.01	No	

2. Prescribed Regional Ecosystem within a Mapped Wetland

A review of the Vegetation Management Wetlands Map determined that three small wetlands occur in the north-east of the Project Site. These wetlands areas contain State-mapped Regulated Vegetation containing prescribed REs.

The SRI assessment of prescribed REs occurring within a wetland area is detailed in Table 53. As specified by Section 2.1 of the Significant Residual Impact Guideline (Department of the Environment and Heritage Protection, 2014), for a prescribed activity to have a SRI on a regional ecosystem that lies within a mapped wetland, both criteria 1 (Table 51) and criteria 2 (clearing within 50 m of a defining bank) must be exceeded.

A total of 2.24 ha of State-mapped remnant vegetation comprising four REs (RE 11.3.27b, RE 11.3.1, RE 11.3.2 and RE 11.3.25) occurs within the areas of mapped wetland within the Project impacts areas (construction and operational (ponding) impacts).

The structure category of 'Other' is not included in criteria 1. As such, the structural formation of the community determined during the field assessment was used instead (mid-dense). For the two sparse REs (RE 11.3.2 and 11.3.25) and RE 11.3.1, Project impact areas do not exceed criteria 1 threshold levels detailed in Table 51. In contrast, the maximum potential impact area of RE 11.3.27b does exceed threshold levels. Given this, and that clearing will occur within 50 m of a defining bank for both wetland areas, an SRI is likely (Table 53).

Table 53 SRI assessment for REs within a mapped wetland area

RE	Structure Category	Impact Area (ha)			Clearing within 50 m of a defining bank	Impact Threshold Exceeded?	SRI Outcome
		Construction	Operation	Total			
11.3.2	Sparse	0.24	-	0.24	Y	No	**No**
11.5.3	Sparse	0.02	-	0.02	Y	No	
11.3.27b	Mid-dense	1.89	0.00	1.89	Y	No	

3. Prescribed Regional Ecosystem within the Defined Distance of a Watercourse

A review of the Vegetation Management Watercourse Map determined that multiple major and minor watercourses traverse the Project Site, ranging from 1 to 4 in stream order. These watercourses occur within or intersect the impact areas at multiple locations. Areas adjacent to these watercourses contain State-mapped Regulated Vegetation containing prescribed REs. In accordance with Schedule 2 clause 2, subsections (4) and (6) of the Environmental Offsets Regulation 2014, to determine the extent of the prescribed REs within the defined distance, watercourses with a stream order of 1 or 2 were buffered by 25 m while watercourses with a stream order of 3 or 4 were buffered by 50 m.

The SRI assessment of prescribed REs occurring within the defined distance of a watercourse is detailed in Table 54. As specified by Section 2.1 of the Significant Residual Impact Guideline (Department of the Environment and Heritage Protection, 2014), for a prescribed activity to have a SRI, both criteria 1 (Table 51) and criteria 3 (clearing within 5 m of a defining bank) must be exceeded.

Five REs (RE 11.3.1, RE 11.3.2, RE 11.3.25, RE 11.5.3 and RE 11.5.9b) occur within the defined banks of the watercourses intersecting Project impact areas (construction and operational ponding). The maximum impact areas of each RE and their corresponding structure category as defined by the REDD are summarised in Table 54.

All prescribed REs within the defined distance of a watercourse have a structure category of sparse. For two of the five prescribed REs, maximum Project impact areas exceed criteria 1 threshold levels (Table 51). Clearing for the Project will also occur within 5 m of the defining banks of the watercourses. Therefore, impacts to prescribed REs within the defined distance of a watercourse is likely to result in a SRI.

Table 54 SRI assessment for REs within a defined distance of a watercourse

RE	Structure Category	Impact Area (ha)			Clearing within 50 m of a defining bank	Impact Threshold Exceeded?	SRI Outcome
		Construction	Operation	Total			
11.3.1	Mid-dense	0.00	0.00	0.00	N	No	**Yes**
11.3.2	Sparse	2.75	0.00	2.75	Y	Yes	
11.3.4	Sparse	0.01	0.00	0.01	N	No	
11.3.25	Sparse	11.06	0.94	12.03	Y	Yes	
11.4.8	Sparse	0.40	0.00	0.43	Y	No	
11.4.9	Sparse	0.00	0.00	0.00	N	No	
11.4.13	Very sparse	0.00	0.00	0.00	N	No	
11.5.3	Sparse	1.55	0.01	1.56	Y	No	

Connectivity areas

The Department of Environment, Science and Innovation has developed a Landscape Fragmentation and Connectivity (LFC) tool to assist in identifying and quantifying any significant impact on connectivity for an individual impact area (see Appendix D for LFC tool outputs). The Project impact areas (construction and operational (ponding) impacts) covers a total area of approximately 1,295.25 ha of which 155.44 ha is mapped as remnant vegetation as per the DoR Regulated Vegetation mapping. The measure of impact significance is based on how the prescribed activity will change the size and configuration of remnant vegetation areas and the level of fragmentation that will result at the local scale (5 km radius) given regard to the regional scale (20 km radius).

A significant impact assessment has been completed for connectivity against Section 3.2 of the Significant Residual Impact Guideline (Department of the Environment and Heritage Protection, 2014) (Table 55).

Table 55 Significant impact assessment for connectivity

Impact Criteria	SRI Outcome
An action is LIKELY to have a SRI on connectivity if the action will result in:	
1. The change in the core remnant ecosystem extent at the local scale (post impact) is greater than a threshold determined by the level of fragmentation at the regional scale **OR** 2. Any core area that is greater than or equal to 1 ha is lost or reduced to patch fragments (core to non-core)	**Yes.** An analysis of the State vegetation mapping within the Project impact areas (construction and operational (ponding) impacts) using the LFC tool determined impacts to connectivity areas did exceed the threshold. Significance test one: • The regional total area is 272,725.57 ha • The regional extent of core remnant is 114,107.86 ha • The regional extent of core remnant is 41.84 per cent • This level of regional fragmentation sets a local impact threshold of: 10.0 per cent Area of core at the local scale (pre impact): 13,066.81 Area of core at the local scale (post impact): 12,833.08 Percent change of core at the local scale (post impact): 1.79 per cent Significant test two: • The number of core remnant areas occurring on the site: 15 • The number of core remnant areas remaining on the site post impact: 10 • Only core polygons greater than or equal to 1 hectare are included This analysis has determined a significant impact on connectivity areas. (A significant reduction in core remnant at the local scale is False or a change from core to non-core at the site scale is True). Total area of RVM Cat B clearing is 183.22 hectares for local preferred scale remnant ecosystem (Test 1 = 1.79 per cent change post impact), however the result in the loss or fragmentation of preferred remnant ecosystem at the site scale was determined (Test 2 = a change in core remnant areas (2) post impact, from 15 core remnant areas occurring on site, to 10 areas post impact). The LFC analysis has determined a significant impact on connectivity areas. Change from core to non-core at the site scale was found to be true. Therefore, the Project is likely to have a significant impact on connectivity areas up to 223.65 ha.

Protected Wildlife Habitat

Protected wildlife habitat is defined as an area of habitat (e.g. foraging, roosting, nesting or breeding habitat) for an animal or plant that is Endangered or Vulnerable, or a Special Least Concern (non-migratory) animal under the NC Act. As of 9 May 2018, under the *Vegetation Management and Other Legislation Amendment Bill 2018*, the definition of protected wildlife has been extended to include Near Threatened wildlife.

Offsets may be required for the following protected wildlife habitat:

- an area that contains plants that are 'endangered' or 'vulnerable' wildlife;
- a habitat for an animal that is 'endangered', 'vulnerable' or 'near threatened' wildlife or a special least concern animal (non-migratory), including areas or features used by an animal for foraging, roosting, nesting or breeding;

To avoid duplication of offset conditions between jurisdictions, State and local governments can only impose an offset condition in relation to a prescribed activity if the same or substantially the same impact and the same or substantially the same matter has not been subject to assessment under the EPBC Act. As such, SRI assessments for protected wildlife habitat have only been completed for the known or likely conservation significant species that have not already been assessed under the EPBC Act policy statement 'Significant Impact Guidelines 1.1 – Matters of National Environmental Significance' (DotE, 2013) (refer to Section 11.1). These species are:

- Grey Falcon (*Falco hypoleucos*)
- Short-beaked Echidna (*Tachyglossus aculeatus*).

Grey Falcon (*Falco hypoleucos*)

The Grey Falcon (*Falco hypoleucos*) is listed as Vulnerable under the NC Act.

The Grey Falcon (*Falco hypoleucos*) is endemic to mainland Australia, occurring across the arid and semi-arid regions including the Murray-Darling Basin, Eyre Basin, central Australia and western Australia (Threatened Species Scientific Committee, 2020).

This species is elusive and rare, occurring at low densities across its distribution. It is largely restricted to areas of high annual average temperatures and average annual rainfall of less than 500 mm. It has been recorded in timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined watercourses. They have also been observed foraging in treeless areas and in tussock grassland and open woodland, especially in winter. Grey Falcons (*Falco hypoleucos*) are almost exclusively a predator of birds, however they may also consume other prey such as small mammals and reptiles.

Breeding occurs from June to November, with eggs generally being laid in the old nests of other birds, namely those of other raptors or corvids. It is reported that nests in the tallest trees, especially *Eucalyptus camaldulensis* (River Red Gum) and *Eucalyptus coolabah* (Coolabah) along watercourses are preferred (Threatened Species Scientific Committee, 2020). However, like other falcons this species may also nest in telecommunication towers. There are no known breeding pairs.

Occurrence and Potential Habitat

This species was not confirmed within the Project Site during any of the field surveys. Given this species is rare and occurs in low densities throughout its range, recorded occurrences are limited. The nearest publicly available record occurs approximately 85 km to the north west (undated, spatial uncertainty of 500 m). However, in 2005 EcoServe recorded the species on the adjacent Saraji Mine and as such this species is considered likely to occur.

Due to the broad definition of suitable habitat for this species, all vegetation within the Project Site is considered to provide some value for the lifecycle requirements of the Grey Falcon (*Falco hypoleucos*). Habitat present is comprised of preferred (areas of RE 11.3.25 and 11.3.27b suitable for breeding), suitable (remnant and regrowth vegetation containing *Acacia sp.* likely suitable for foraging) and marginal (remaining vegetative areas including non-remnant grassland which may potentially be utilised for foraging and dispersal). No Essential Habitat for this species occurs within the Project Site.

The extent of potential habitat for the species is summarised in Table 56 and displayed in Figure 20.

Table 56 Potential habitat for Grey Falcon (Falco hypoleucos)

Habitat Description	Potential Habitat Type	Total Area (ha) within the Project Site	Construction Phase Impacts (ha)	Operational Phase Impacts (i.e. ponding) (ha)	Impact Area Total (ha)
Remnant vegetation that is dominated by *Eucalyptus* spp. in the canopy and associated with a water source (i.e. watercourses or wetlands).	Preferred	208.72	14.95	2.94	17.89
Remnant or regrowth vegetation that contains *Acacia* spp.	Suitable	2,453.78	352.81	54.86	407.67
All other vegetation that does not contain *Acacia* spp., including regrowth and non-remnant areas	Marginal	7,979.29	673.66	58.52	732.18
Total		**10,641.79**	**1,041.42**	**116.32**	**1,157.74**

An assessment against the Significant Residual Impact Guideline for this species is provided in Table 57.

Table 57 Significant impact assessment for Grey Falcon (*Falco hypoleucos)*

Impact Criteria	Assessment
An action is LIKELY to have a SRI on habitat for an animal that is 'Endangered' or 'Vulnerable' or 'Near Threatened' wildlife if the action will:	
Lead to a long-term decrease in the size of a local population?	**No.** This species was not recorded during field surveys however was considered likely to occur based on the presence of potential habitat and a 2005 record at the adjacent Saraji Mine. There is limited evidence of any recent utilisation by the species with the closest historical record (no date provided) approx. 75 km north-west of the Project Site (ALA. 2022). Any individuals that may utilise the Project Site are considered to constitute a local population. All vegetation within the Project Site is considered to provide some habitat opportunities to the species (a total area of 10,641.79 ha), largely due to its broad foraging requirements and highly mobile nature. While unconfirmed, the species is suspected of having a large home range >100 km^2 (NSW Scientific Committee, 2009). Potential habitat within the Project Site comprises preferred (suitable for breeding), suitable (preferred foraging areas) and marginal (potential foraging opportunities and dispersal). A total of 1,157.74 ha of potential habitat may be impacted by the Project, including 1,041.42 ha which will be directly impacted by construction impacts and 116.32 ha from subsidence areas subject to ponding during the operational phase. Potential habitat that will be impacted includes 17.89 ha of preferred, 407.67 ha of suitable and

Impact Criteria	Assessment
An action is LIKELY to have a SRI on habitat for an animal that is 'Endangered' or 'Vulnerable' or 'Near Threatened' wildlife if the action will:	
	732.18 ha of marginal habitat. The area of total potential habitat being directly impacted constitutes approximately 11 per cent of the available potential habitat within the Project Site. However, of this impacted area only 17.89 ha is suitable for breeding (preferred). This loss of breeding habitat constitutes approximately 8.6 per cent of the available preferred habitat within the Project Site. In contrast to the foraging and dispersal requirements of the species, breeding and nesting requirements are specific and as such this habitat is likely to be important for the persistence of the local population. Furthermore, due to the species large home range, the Project is considered unlikely to impact the total pool of resources available for the population within the surrounding areas. Of the potential habitat that may be indirectly impacted by ponding, 2.94 ha comprises preferred habitat. Indirect impacts to potential habitat from subsidence impacts resulting in prolonged ponding will not be immediate, potentially occurring as mining progresses over time. As mentioned in Section 9.1.2.1, subsidence areas, excluding ponded areas, are unlikely to result in the loss of habitat values over the duration of the Project. Potential impacts to all potential habitat within the modelled subsidence will be managed and monitored in accordance with the Project's Subsidence Management Plan. As the overall reduction in potential habitat, and namely preferred habitat is low relative to the amount of habitat that will remain, the Project is considered unlikely to lead to a significant reduction in the foraging or breeding success of a local population or a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species?	**No.** This species primarily occurs across the arid and semi-arid regions including the Murray-Darling Basin, Eyre Basin, central Australia and western Australia. It has a very large extent of occurrence (estimated 6.1 million km^2). Approximately 11 per cent of the potential habitat within the Project Site will be impacted via vegetation clearing or modification from prolonged ponding (1,157.74 ha). Subsidence areas, excluding ponded areas, are unlikely to result in the loss of habitat values over the duration of the Project and will be managed in accordance with the Project's Subsidence Management Plan. Given this species is highly mobile and has a large home range, the availability of potential habitat that will remain within the Project Site and the wider area, it is unlikely the Project will reduce the extent of occurrence of the species.
Fragment an existing population?	**No.** This species was not recorded during field surveys however was considered likely to occur based on the presence of potential habitat and a 2005 record at the adjacent Saraji Mine. There is limited evidence of any recent utilisation by the species with the closest historical record (no date provided) approx. 75 km north-west of the Project Site (ALA. 2022). As the Grey Falcon (*Falco hypoleucos*) has a large distribution, it is considered that all individuals are part of a single population. However, no population trend data is available. This species occurs at low densities across its range, indicating that any individuals present within the Project Site are likely to only constitute a small portion of the total population. Approximately 11 per cent of the potential habitat within the Project Site will be impacted via vegetation clearing or modification from prolonged ponding

Impact Criteria	Assessment
An action is LIKELY to have a SRI on habitat for an animal that is 'Endangered' or 'Vulnerable' or 'Near Threatened' wildlife if the action will:	
	(1,157.74 ha). Subsidence areas, excluding ponded areas, are unlikely to result in the loss of habitat values over the duration of the Project and will be managed in accordance with the Project's Subsidence Management Plan. However, this species is highly mobile and is unlikely to rely on ground vegetation for dispersal. Areas of potential subsidence and surface infrastructure constructed for the Project are unlikely to create a barrier to movement. Furthermore, based on the species mobility and large home ranges, impacts associated with the Project are unlikely to be at a scale that would result in fragmentation of a population present. As such, the Project is considered unlikely to fragment an existing population.
Result in genetically distinct populations forming as a result of habitat isolation?	**No.** This species is widely distributed and already occurs at low densities. It has broad foraging and dispersal requirements and as such Project impacts are unlikely to be at a scale that will result in fragmentation/isolation of a population present. Approximately 11 per cent of the potential habitat within the Project Site will be impacted via vegetation clearing or modification from prolonged ponding (1,157.74 ha). The Project will also result in impacts to breeding and nesting habitat (preferred), however this loss of habitat constitutes just over 8.6 per cent of the available preferred habitat within the Project Site. Furthermore, this species is highly mobile and the Project is unlikely to create a barrier to movement. Therefore, the Project will not result in a genetically distinct populations forming as a result of habitat isolation.
Result in invasive species that are harmful to an endangered, vulnerable or near-threatened species becoming established in the endangered, vulnerable or near-threatened species' habitat?	**No.** As per the species' Conservation Advice, predation by cats and grazing by exotic herbivores are both considered 'very high' priority threats to the species (TSSC, 2020). Cattle grazing occurs within the Project Site and feral cats (*Felis catus**) are known to occur in the Project Site, however implementation of mitigation measures during the construction and operational phases of the Project will assist in managing pest levels within the Project Site. A Weed and Pest Management Plan will also be implemented which will include measures to contain or eradicate pests. As such, the Project is unlikely to result in the introduction or proliferation of invasive species that are harmful to Grey Falcon (*Falco hypoleucos*).
Introduce disease that may cause the population to decline?	**No.** Disease is not a considered a potential threat to the species. Nonetheless, best practice weed and pest hygiene measures will be developed and implemented for all Project related activities.
Interfere with the recovery of the species?	**No.** A recovery plan is not required as per the species' Conservation Advice. However, priority conservation actions have been developed and include: • Support improved fire and grazing management in areas where Grey Falcons are known to occur. • Protect known nesting trees and include adequate exclusion buffers with regard to proposed developments and land clearing activities. • Support the establishment and survival of replacement nest trees in areas where Grey Falcon in known to breed. • Retain artificial structures with known or potential Grey Falcon nests. • Control invasive cats and camels in areas where Grey Falcons are known to occur, especially in known roosting and nesting areas.

Impact Criteria	Assessment
An action is LIKELY to have a SRI on habitat for an animal that is 'Endangered' or 'Vulnerable' or 'Near Threatened' wildlife if the action will:	
	Although 17.89 ha of potential preferred habitat for nesting will be impacted by the Project, the species is not a known occurrence and it is currently unclear if Grey Falcon (*Falco hypoleucos*) breed within the Project Site. Subsidence areas, excluding ponded areas, are unlikely to result in the loss of habitat values over the duration of the Project and will be managed in accordance with the Project's Subsidence Management Plan. Any potential Grey Falcon (*Falco hypoleucos*) nests will not be tampered with unless the species is included in a high-risk species management program approved by DESI. Based on this, the Project is unlikely to interfere with the recovery of the species.
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species?	**No.** Potential habitat suitable for foraging (suitable) and breeding (preferred) occurs within the Project Site, however the species or signs of usage by the species were not recorded. The species was not recorded during field surveys and considered likely to occur based on the presence of potential habitat and a 2005 record on the adjacent Saraji Mine. There is limited evidence of any recent utilisation by the species with the closest historical record (no date provided) approx. 75 km north-west of the Project Site (ALA. 2022). As previously noted, this species only has specific requirements for breeding and nesting however there is no information to suggest this habitat within the Project impact areas ecologically significant. A total of 17.89 ha of preferred habitat will be impacted via vegetation clearing; a loss of just over 8.6 per cent of the available preferred habitat within the Project Site. Subsidence areas, excluding ponded areas, are unlikely to result in the loss of habitat values over the duration of the Project and will be managed in accordance with the Project's Subsidence Management Plan. Given this relatively small direct loss of preferred habitat, the species high mobility, large home ranges and wide distribution, the Project is considered unlikely to cause disruption to ecologically significant locations of the species.

Short-beaked echidna (*Tachyglossus aculeatus*)

The Short-beaked Echidna (*Tachyglossus aculeatus*) is listed as Special Least Concern under the NC Act.

The Short-beaked Echidna (*Tachyglossus aculeatus*) is found throughout Australia, including Tasmania. It is Australia's most widespread native animal (The Australian Museum, 2018). No systematic study of the ecology of the Short-beaked Echidna (*Tachyglossus aculeatus*) has been published, but studies of several aspects of their behaviour have been conducted. Individuals are solitary, wanderers: they have large, overlapping home ranges (up to 50 ha) and only maintain a fixed shelter or nest site when rearing their young in a burrow (Augee, Gooden, & Musser, 2006). They avoid extremes in temperature by sheltering in hollow logs, rock crevices and vegetation. Limited only by an insufficient supply of ants or termites, Short-beaked Echidnas (*Tachyglossus aculeatus*) live in a range of climates and habitats.

This species is not threatened with extinction, but human activities, such as hunting, vehicles, habitat destruction, and the introduction of foreign predatory species and parasites, have reduced its distribution in Australia (The Australian Museum, 2018). This species can live anywhere with a good supply of food, and regularly forages on ants and termites, and are most common in forested areas with abundant, termite-filled, fallen logs.

The solitary Short-beaked Echidna (*Tachyglossus aculeatus*) looks for a mate between May and September; the precise timing of the mating season varies with geographic location. The Short-beaked

Echidna (*Tachyglossus aculeatus*) is an egg-laying mammal (monotreme) and lays one egg at a time. The eggs hatch after about 10 days and the young, emerge blind and hairless. Clinging to hairs inside the mother's pouch, the young echidna suckles for two or three months. Once it develops spines and becomes too prickly, the mother removes it from her pouch and builds a burrow for it. It continues to suckle for the next six months (The Australian Museum, 2018).

Occurrence and Potential Habitat

This species was confirmed within the Project Site during the field surveys.

Given the very broad utilisation of habitat by this species, all vegetation within the Project Site is considered to provide potential habitat. Habitat present is comprised of suitable (vegetation that provides a variety of sheltering opportunities) and marginal (vegetation that provides minimal sheltering opportunities). No Essential Habitat for this species occurs within the Project Site.

The extent of potential habitat for the species is summarised in Table 58 and displayed in Figure 21.

Table 58 Potential habitat for Short-beaked Echidna (Tachyglossus aculeatus)

Habitat Description	Potential Habitat Type	Total Area (ha) within the Project Site	Construction Phase Impacts (ha)	Operational Phase Impacts (i.e. ponding) (ha)	Impact Area Total (ha)
All remnant and regrowth vegetation; a variety of sheltering opportunities present.	Suitable	4,389.38	310.08	95.38	405.46
Non-remnant vegetation; sheltering opportunities largely restricted to grass cover.	Marginal	6,252.41	577.27	20.94	598.21
Total		**10,641.79**	**1,041.42**	**116.32**	**1,003.67**

An assessment against the Significant Impact Guideline for this species is provided in Table 59.

Table 59 Significant impact assessment for Short-beaked Echidna (Tachyglossus aculeatus)

Impact Criteria	Assessment
An action is LIKELY to have a SRI on habitat for an animal that is 'Special Least Concern' wildlife if the action will:	
Lead to a long-term decrease in the size of a local population?	**No.** This species is known to occur within the Project Site and potentially utilises all habitat types (a total area of 10,641.79 ha). This species is common throughout its distribution and any individuals that occur within the Project Site are considered to constitute a local population. Potential habitat within the Project Site comprises suitable (remnant and regrowth vegetation which provides sheltering opportunities) and marginal (non-remnant vegetation which provides limited sheltering opportunities). A total of 1,157.74 ha of habitat may be impacted by the Project, including 1,041.42 ha which may be impacted during the construction phase and 116.32 ha subsidence areas subject to ponding during the operational phase. Potential habitat that will be impacted includes 405.46 ha of suitable and 598.21 ha of marginal habitat. The area of total potential habitat being impacted constitutes approximately 9.4 per cent of the available potential habitat within the Project Site. This loss of habitat relative to the amount of habitat that will be retained within the Project Site, as well as the extensive areas of potential habitat in the local area is considered minimal. Furthermore, where clearing occurs habitat features suitable for sheltering such as felled trees and logs will be relocated to adjacent habitat areas where practical. Indirect impacts to potential habitat from subsidence impacts resulting in prolonged ponding will not be immediate, potentially occurring as mining progresses over time. Potential impacts to all potential habitat within the modelled subsidence will be managed and monitored in accordance with the Project's Subsidence Management Plan. As the species is likely to occur in high numbers and the overall reduction in potential habitat is relatively low, the Project is considered unlikely to lead to a significant reduction in the foraging or breeding success of a local population or a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species?	**No.** This species occurs across Australia and is considered common. Approximately 9.4 per cent of the potential habitat within the Project Site will be impacted via vegetation clearing and modification from prolonged ponding (1,157.74 ha). Subsidence areas, excluding ponded areas, are unlikely to result in the loss of habitat values over the duration of the Project and will be managed in accordance with the Project's Subsidence Management Plan. Given this species is relatively mobile, the availability of potential habitat that will remain within the Project Site and the likely large availability of potential habitat in the wider area, it is unlikely the Project will reduce the extent of occurrence of the species.

Impact Criteria	Assessment
An action is LIKELY to have a SRI on habitat for an animal that is 'Special Least Concern' wildlife if the action will:	
Fragment an existing population?	**No.** Discrete sub-populations of short-beaked echidna are not known, and available population information indicates that this species is stable throughout its range. Any individuals present within the Project Site are likely to only constitute a very small portion of the total population. Approximately 9.4 per cent of the potential habitat within the Project Site will be directly impacted via vegetation clearing (1,157.74 ha). Subsidence areas, excluding ponded areas, are unlikely to result in the loss of habitat values over the duration of the Project and will be managed in accordance with the Project's Subsidence Management Plan. However, as this species is relatively mobile and surface infrastructure that will be constructed for the Project is unlikely to create a barrier to movement, the Project is considered unlikely to fragment an existing population.
Result in genetically distinct populations forming as a result of habitat isolation?	**No.** This species is widely distributed and common. It has broad habitat requirements and as such impacts to potential habitat within the Project Site is unlikely to have population-level impacts. The functional habitat connectivity in an east to west direction is interrupted by the Saraji Mine complex directly west of the Project Site and the Project Site is already bisected by the Lake Vermont Road and railway corridor as well as Golden Mile Road in the south. However, the northern portion of the Project Site forms part of a large contiguous area of remnant vegetation which provides significant dispersal opportunities to the north and east. This species is relatively mobile and the Project is unlikely to create a barrier to movement between the Project Site and adjacent available habitat. Therefore, the Project is unlikely to result in a genetically distinct population forming as a result of habitat isolation.
Cause disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species?	**No.** Potential habitat suitable for breeding, foraging and dispersal occurs within the Project Site, however there is no information to suggest this habitat is ecologically significant. A total of 1,157.74 ha of potential habitat will be impacted via vegetation clearing and modification from prolonged ponding, comprising approximately 9.4 per cent of the available potential habitat within the Project Site. Subsidence areas, excluding ponded areas, are unlikely to result in the loss of habitat values over the duration of the Project and will be managed in accordance with the Project's Subsidence Management Plan. Given the extent of habitat impacted, the extensive availability of likely high quality habitat in the region, as well as the species' mobility and common occurrence, the Project is considered unlikely to cause disruption to ecologically significant locations of the species.

Waterway Providing for Fish Passage

An environmental offset may be required for any part of a waterway that provides for passage of fish (other than that part of a waterway within an urban area) if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway. Barriers to fish passage can restrict and/or isolate fish communities, preventing access to, and benefits of fish habitats otherwise available to them. Poorly designed structures can injure or kill fish moving over or around them, or fish may become stranded and subjected to inappropriate water

quality, lack of food, increased predation, crowding or other conditions that impact on their health, wellbeing and productivity.

Watercourses in and surrounding the Project Site range from stream order 6 (Boomerang Creek), stream order 5 (Phillips Creek) and stream order 3 (Plumtree, One Mile, Hughes and Barrett Creeks). The main stem of these watercourses is mapped as having major (purple; Boomerang and Phillips Creeks), high (red; One Mile, Hughes and Barret Creeks) and amber (moderate; Plumtree Creek) risk of impact to fish passage by waterway barrier works, indicating that the State considers these watercourses to be important corridors for fish movement. Smaller upstream tributaries of these watercourses have low (green) risk of impact from waterway barrier works.

The detailed design of the Project will determine if construction, installation or modification of waterway barrier works within the waterways of the Project Site will limit the passage of fish. However, a preliminary aquatic ecology risk assessment has been completed by frc environmental and potential impacts to fish passage as a result of the Project were assessed. Potential impacts to fish passage may arise from subsidence, discharge of mine-affected water, construction of water crossings, vegetation clearing and earthworks and the operation and maintenance of the Project. Findings of the assessment determined that the risk of fish passage impacts in the watercourses of the Project Site is low. The full assessment is detailed in the Project Aquatic Ecology Technical Report (Hydrobiology, 2023).

A significant impact assessment has been completed for the waterways against Section 10.1 of the Significant Residual Impact Guideline (Department of the Environment and Heritage Protection, 2014) (Table 60).

Table 60 Significant impact assessment for fish passage waterways

Impact Criteria	Assessment
An action is LIKELY to have a SRI on a waterway providing for fish passage if the action will result in:	
The mortality or injury of fish species; **OR**	**No.** All aquatic species recorded by frc environmental from watercourses in and surrounding the Project Site are tolerant of ephemeral flow and variable water quality, and all are common and widespread in the region. No sensitive aquatic environmental receptors are likely to occur in watercourses in, or surrounding, the Project Site. Potential impacts to fish and fish passage may occur as a result of subsidence, discharge of mine-affected water, construction of water crossings, vegetation clearing and earthworks and the operation and maintenance of the Project. However, with the implementation of mitigation measures including the Subsidence Management Plan, sensitive water crossing design where practical, appropriate stream bed and bank rehabilitation and construction timing (during the dry season), the overall risk of impacts to fish (including reduced heath, injury or mortality) as a result of the Project activities is deemed low.
Conditions that substantially increase risks to the health, wellbeing and productivity of fish seeking passage such as through the depletion of fishes energy reserves, stranding, increased predation risks, entrapment or confined schooling behaviour in fish; **OR**	
A reduced extent, frequency or duration of fish passage than previously found at site; **OR**	**No.** The detailed design of the Project will determine if construction, installation or modification of waterway barrier works within the waterways of the Project Site will limit the passage of fish. However, with the implementation of mitigation measures including the Subsidence Management Plan, sensitive water crossing design where practical, appropriate bed and bank rehabilitation works and construction timing (during the dry season), changes to fish passage as a result of the Project activities are anticipated to be minimal.

Impact Criteria	Assessment
An action is LIKELY to have a SRI on a waterway providing for fish passage if the action will result in:	
Areas of fish habitat (including, but not limited to in-stream vegetation, snags and woody debris, substrate, bank or riffle formations) necessary for the breeding and/or survival of fish being substantially modified, destroyed or fragmented; **OR**	**No.** The Project Site is on a floodplain, with watercourses having well-defined channels that follow an irregular sinuous pattern. Aquatic habitat is dominated by small isolated pools within the channel interspersed with large areas of dry stream bed, with larger pools typically found in artificial waterbodies. Larger pools are likely to be perennial or near-perennial and important refugial habitat for aquatic fauna. Sedimentation of watercourses can impact aquatic ecology by smothering stream beds with fine material, and decreasing bed roughness and reducing habitat diversity. Aquatic weeds can also reduce the habitat quality of watercourses for native fish, and dense growth of aquatic weeds can cause a barrier to fish passage. Mitigation of sedimentation impacts will be achieved by implementation of an Erosion and Sediment Control Plan (ESCP) during the construction, operation and rehabilitation phases of the Project, and implementation of a Rehabilitation Management Plan. All vehicles and machinery entering and leaving the Project Site will be subject to strict weed hygiene protocols to control the spread of weeds, including aquatic weeds. As such, areas of fish habitat within the Project Site are unlikely to be substantially modified, destroyed or fragmented as a result of the Project.
Substantial and measurable changed in the hydrological regime of the waterway, for example, a substantial change to the volume, depth, timing, duration and frequency of flows; **OR**	**No.** All aquatic species recorded by frc environmental from watercourses in and surrounding the Project Site are tolerant of ephemeral flow and are common and widespread in the region. Discharges of mine-affected water may impact flow patterns and aquatic ecology in the receiving environment, however no discharges of mine-affected water are planned as part of the Project. Impacts to flow patterns may also occur in lowered sections of stream bed (as a result of subsidence) and where construction of creek crossings leads to increased bank erosion. Potential impacts to watercourse flow patterns during all phases of the Project will be mitigated through the Subsidence Management Plan, the ESCP and the Rehabilitation Management Plan. As such, Project activities are unlikely to lead to substantial and measurable changes in the hydrological regimes of the Project Site waterways.
Significant changes in water quality parameters such as temperature, dissolved oxygen, pH and conductivity that provide cues for movement in local fish species.	**No.** All aquatic species recorded by frc environmental from watercourses in and surrounding the Project Site are tolerant of variable water quality and are common and widespread in the region. Unplanned discharges of mine-affected water (i.e. water with potentially high electrical conductivity, high or low pH, and potentially high concentrations of metals and sulfates) may impact water quality, flow patterns and aquatic ecology in the receiving environment. No discharges of mine-affected water are planned as part of the Project. Impacts to water quality may also occur where creek crossings are in areas with either pooled or flowing water. To minimise potential water quality impacts, isolation of the workspace will occur. Water quality will be monitored in accordance with a site Water Management Plan (WMP) to ensure that key water quality parameters remain within acceptable criteria. As such, Project activities are unlikely to lead to significant changes in water quality parameters.

11.3 Offsets

While mitigation and management measures for impacts on terrestrial ecology focus on maximising retention of vegetation across the underground mine footprint, offsets may be required for those areas where vegetation clearing is unavoidable, and in relation to fragmentation due to IMG management infrastructure and potentially from subsidence effects resulting in ponding. The impact areas associated with the construction and operational phases of the Project includes both MNES and MSES. These include TECs, habitat for listed threatened species and State protected vegetation communities. Watercourse and connectivity MSES also have the potential to be impacted.

The Project will be subject to the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offsets Framework. Potential synergies exist between the EPBC Act Environmental Offsets Policy and offset policies administered by the Queensland Government. The EPBC Act Environmental Offsets Policy and EO Act support the development of complementary offset packages. The overlapping MNES and MSES will be considered when developing offset packages for the Project and offset delivery will preferentially secure offset areas which satisfy both MNES and MSES.

BMA propose to provide land based offsets through a staged offset strategy which will be finalised at issue of the environmental authority (mining) for the Project and will be based on determination of actual clearing areas as mining and associated IMG management and subsidence progress. This staged offset strategy will be aligned to BMA's mine planning cycle to allow accurate identification of actual offsets required in each stage of mining. BMA currently conducts mine planning on a five year cycle.

It is expected that the offsets may be staged as set out in the Project Environmental Offset Strategy (BMA, 2024c).

A vegetation condition monitoring program with baseline performance targets will be conducted to support and inform this approach. This program will allow BMA to identify significant biodiversity values prior to clearing and subsidence and then, post subsidence; identify the net loss of values. This will be done on a five yearly cycle as set out in Project Environmental Offset Strategy (BMA, 2024c). As part of this program, BMA will establish the ecological equivalence of significant biodiversity values prior to any disturbance to inform compensatory measures of these values either through rehabilitation or land based offsets.

12.0 Conclusions and recommendations

The desktop and ecological field surveys conducted for the Project have documented a range of flora and fauna. Several flora communities of conservation significance exist within the Project Site, including listed threatened ecological communities and EREs. Although some areas of remnant vegetation remain intact, most have been modified to some extent by historical and current land management practices. The most common modification is the removal of the shrub and ground layers and replacement with pasture grass species to support grazing.

The majority of the fauna habitat within the Project Site is generally of low conservation value. Some habitats such as the riparian zones and alluvial woodland act as a wildlife corridor and the oxbow wetland and the *Acacia harpophylla* (Brigalow) woodland with gilgai possess greater potential for supporting conservation significant fauna.

Flora

Systematic flora surveys were carried out for the Project Site during 2007, 2008, 2010 by SKM, and in 2016, 2017 and 2020 by AECOM. Flora surveys were undertaken using guidelines established by the Queensland government. The aim of the flora study was to document the flora values with particular reference to the occurrence of conservation significant vegetation communities and species.

The ecological values of the Project Site are considered typical for the northern Bowen Basin with large areas of land historically cleared for grazing. The flora survey identified a total of ten REs, including three listed as endangered, six listed as of concern and one listed as 'no concern at present' as per the Biodiversity Status.

The literature review identified four EPBC Act TECs as potentially present within the Project Site. The presence of two of these communities has been confirmed on site: *Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* and *Brigalow (Acacia harpophylla dominant and co-dominant)*. The TECs were surveyed using the methodology outlined within the Commonwealth Government approved listing advice for determining whether these met the criteria for classification as a TEC.

The Natural Grasslands community met the condition threshold of 'good quality' for the EPBC Act listed community and the Brigalow community met the condition thresholds for the TEC within most patches of analogous REs. Where analogous REs existed but did not meet the condition thresholds, the TEC was not mapped or considered in area calculations.

The literature review identified five flora species of conservation significance as potentially occurring in the survey area. Of the five species, field surveys confirmed the presence of one; bluegrass which is listed as vulnerable under the EPBC Act. One additional species of conservation significance, *Dichanthium queenslandicum* (King Bluegrass), was considered likely to occur within the Project Site; with *Aristida annua* and *Cerbera dumicola* identified as possibly occurring given the habitat available.

Of the 40 exotic species recorded during the vegetation surveys within the Project Site, 11 species were identified as being of management concern. These are listed as 'Restricted Matter' under the *Biosecurity Act 2014* and are listed below:

- *Vachellia nilotica** (Prickly Acacia)
- *Harrisia martinii** (Harrisia Cactus)
- *Opuntia stricta** (Prickly Pear)
- *Opuntia tomentosa** (velvety Tree Pear)
- *Parthenium hysterophorus** (Parthenium)
- *Lantana camara** (Lantana)
- *Lantana montevidensis** (Creeping Lantana)
- *Hymenachne amplexicaulis** (Hymenachne)
- *Jatropha gossypiifolia** (Bellyache Bush)

- *Bryophyllum daigremontianum x delagoense** (Mother of Millions Hybrid)
- *Cryptostegia grandiflora** (Rubber Vine).

A total of 1,220.35 ha of remnant vegetation communities may be impacted by the proposed underground mining, surface facilities and infrastructure associated with the Project. This includes the potential indirect disturbance of remnant vegetation associated with subsidence from underground mining operations.

Clearing will cause direct loss of some remnant native vegetation as well as fragmentation of some vegetation communities. A total of 210.31 ha of the *Brigalow (Acacia harpophylla dominant and co-dominant)* TEC, comprising EREs, is located within the Project Footprint and may be subject to direct and indirect impacts of the Project. Less than one hectare of Natural Grassland TEC occurs within and adjacent to the transport infrastructure corridor; however may not require direct clearing as powerlines may span above this vegetation.

Subsidence impacts may also impact on isolated trees where ground movements and surface cracking may affect root zones. While the loss of scattered canopy trees may occur from subsidence relating to surface cracking, these impacts are unlikely to materially impact that remnant status or habitat values associated with this native vegetation (including threatened species and ecological communities). Following subsidence, some areas containing deeper depressions may be subject to prolonged ponding. These areas may be more sensitive to impacts from the Project, resulting in a potential change to the structure and composition of present vegetation.

Disturbance to key biodiversity values including TECs and endangered and of concern REs will be avoided and managed wherever possible. However, residual impacts to some remnant and high value regrowth native vegetation, including TECs, will likely be lost as a result of the Project. Offsets, in accordance with the Queensland Environmental Offsets Framework and the EPBC Act Environmental Offsets Policy, are proposed for these values.

Fauna

Fauna surveys were conducted by SKM in 2007, 2009, 2010 and 2011. Supplementary fauna assessments were undertaken by AECOM in 2016, 2017 and 2020. The aim of the fauna surveys was to document the terrestrial vertebrate fauna and habitat, with particular reference to the occurrence of conservation significant fauna and to undertake an assessment of potential impacts.

A comprehensive literature review was undertaken prior to field survey to assist in targeting survey effort. Systematic fauna surveys were then conducted using methods including trapping, systematic searches, animal call recording and incidental sighting.

The studies identified a total (including exotic fauna) of 188 fauna species as occurring within the Project Site. This includes 117 bird, 33 mammal, 14 amphibian and 24 reptile species. Eleven species recognised under the NC Act and / or EPBC Act as conservation significant were identified during ecological surveys. These species and their status under the NC Act and EPBC Act are listed in Table 61. The literature review identified a further four species listed as threatened or migratory under the EPBC Act and or the NC Act as potentially occurring within the Project Site due to the availability of suitable habitat.

Table 61 Conservation significant species recorded within the Project Site

Common Name	Scientific Name	EPBC Act[1]	NC Act[2]
Ornamental Snake	*Denisonia maculata*	Vulnerable	Vulnerable
Australian Painted Snipe	*Rostratula australis*	Endangered	Vulnerable
Squatter Pigeon (Southern)	*Geophaps scripta scripta*	Vulnerable	Vulnerable
Greater Glider	*Petauroides volans*	Vulnerable	Vulnerable
Grey Falcon	*Falco hypoleucos*	-	Vulnerable
Koala	*Phascolarctos cinereus*	Vulnerable	Vulnerable
Short-beaked Echidna	*Tachyglossus aculeatus*	-	Special Least Concern
Caspian Tern	*Hydroprogne caspia*	Migratory	-
Fork-tailed Swift	*Apus pacificus*	Migratory	Special Least Concern
Latham's Snipe	*Gallinago hardwickii*	Migratory	Special Least Concern
White-throated Needletail	*Hirundapus caudacutus*	Migratory	Special Least Concern

[1] Conservation status under the EPBC Act at the time of submission of the Project EPBC Act referral

[2] Conservation status under the NC Act

Essential Habitat is mapped for two species within the Project Site. Essential Habitat for Squatter Pigeon (*Geophaps scripta scripta*) and Ornamental Snake (*Denisonia maculata*) is mapped based on species habitat models and suitable habitat surrounding previous records of this species. Approximately 724.23 ha of Essential Habitat is located within the Project Footprint. Ground-truthing confirmed habitat for both species within the Project Site and identified similar extents of habitat to the Essential Habitat mapping.

The BPA for the Brigalow Belt Bioregion identifies wildlife corridors within the Project Site:

- Boomerang Creek riparian ecological corridor (State and regional significance); and
- riparian ecological corridors of regional significance associated with:
  - Plumtree Creek and Hughes Creek
  - One Mile Creek
  - Phillips Creek
  - Downs Creek.

These wildlife corridors provide east–west fauna movement opportunities through the landscape and provide suitable habitat for a range of fauna species including the listed Koala (*Phascolarctos cinereus*) and Greater Glider (*Petauroides volans*).

Available habitats within the Project Site were generally degraded by land clearing, introduced pasture grasses and grazing. Nine habitat types were defined; River Red Gum Riparian Woodland, *Eucalyptus* and/or *Corymbia* Open Woodland, Dawson Gum and Brigalow Woodland, Brigalow or Belah Woodland, Oxbow Wetland, Natural Grasslands, Modified Grasslands, Shrubby Brigalow regrowth with gilgai and dams.

Impacts on native animals using the site will include habitat loss and fragmentation from direct impacts of vegetation clearing, as well as disturbance to animals using remnant habitat from noise, light and general activity and possible mortality during vegetation clearing or from vehicle strike. Mitigation measures are proposed to address these impacts and these measures are expected to be effective in avoiding or minimising impacts.

During the operational phase of the Project, some habitat modification may also occur due to subsidence within areas subject to longwall mining. Areas subject to changes in localised topography and surface cracking are unlikely to result in substantial change in habitat values present. The majority

of fauna species using the site are generally resilient to disturbance and do not have highly specialised habitat requirements, and so it is envisaged that these animals will be able to adapt to these habitat changes and also utilise adjacent similar habitat. However, areas containing deeper depressions may be subject to prolonged ponding, resulting in changes to vegetation and habitat values present. It is possible that the Project will have a significant impact on four conservation significant fauna species: Koala (Phascolarctos cinereus), Ornamental Snake (Denisonia maculata), Greater Glider (Petauroides volans) and Squatter Pigeon (Geophaps scripta scripta) due to loss and degradation of habitat. Species specific mitigation measures and offsets will be required to reduce impacts on these species.

Subsidence management and rehabilitation will include a focus on retaining riparian corridors so that they can continue to provide opportunities for fauna dispersal.

Environmentally sensitive areas

The review of ESAs determined that there are no Category A ESAs or Category C ESAs within the Project Site, however these do occur within 100 km of the Project Site. There are a number of Category B ESAs within the Project Site and within 100 km of the Project Site. Desktop analyses and field surveys carried out by AECOM determined that three EREs are present within the Project Site. The total potential impact to EREs and hence Category B ESAs, is 261.61 ha. This is based on a combination of 49.84 ha of construction impacts and 211.77 ha of potential indirect impacts. Mitigation measures are presented to reduce potential impacts to ESAs.

Matters of State Environmental Significance

MSES related to terrestrial ecology within the Project Site may be affected by the Project (Table 62). After all reasonable avoidance and on-site mitigation measures for the Project have been or will be undertaken, a residual impact on MSES is still likely to result. Therefore, the Significant Residual Impact Guideline prepared by the Department of the Environment and Heritage Protection (2014) was used to determine the significance of the residual impact. The outcome of these assessments was that significant impacts are expected for one MSES as outlined in Table 62.

Table 62 Maximum predicted significant impacts on MSES

MSES	Description	Maximum predicted significant impact (ha)			Significant impact	Offset required
		Construction	Operations	Total		
Regulated vegetation (Endangered / Of Concern)	**Endangered RE**	**49.83**	**12.54**	**62.38**	Yes	Yes
	RE 11.3.1	1.96	-	1.96	Yes	
	RE 11.4.8	41.22	12.45	53.67	Yes	
	RE 11.4.9	6.66	0.09	6.75	Yes	
	Of Concern RE	**19.13**	**-**	**19.13**	Yes	Yes
	RE 11.3.2	19.12	46.38	65.50	Yes	
	RE 11.3.4	0.01	-	0.01	No	
Regulated vegetation (within the defined distance of a watercourse)	**RE adjacent to watercourse**	**13.80**	**0.90**	**14.7**	Yes	Yes
	RE 11.4.13	-	-	-	No	
	RE 11.3.25	11.05	0.94	11.9	Yes	
	RE 11.3.4	0.01		0.01	No	
	RE 11.3.2	2.75	-	2.75	Yes	
	RE 11.5.3	1.55	0.01	1.56	No	
	RE 11.3.1	-	-	-	No	
	RE 11.4.8	0.04	0.01	0.05	No	
	RE 11.4.9	-	-	-	No	

MSES	Description	Maximum predicted significant impact (ha)			Significant impact	Offset required
		Construction	Operations	Total		
Regulated vegetation (within the defined distance of a watercourse)	**RE adjacent to watercourse**	**2.15**	**-**	**2.15**	No	No
	RE 11.3.2	0.24	-	0.24	No	
	RE 11.5.3	0.02	-	0.02	No	
	RE 11.3.27b	1.89	-	1.89	No	
Connectivity areas	Connectivity areas	170.69	52.97	223.66	Yes	Yes
Protected wildlife habitat	Squatter pigeon	73.1	40.5	113.6	Yes	Yes (MNES)
	Ornamental snake	332.0	54.2	386.2	Yes	Yes (MNES)
	Koala	84.0	52.3	136.3	Yes	Yes (MNES)
	Greater glider	34.5	4.1	38.6	Yes	Yes (MNES)
	Grey falcon	0.0	0.0	0.0	No	No
	Short-beaked echidna	0.0	0.0	0.0	No	No

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Appendix A

Database Search Results



Vegetation management report

For Lot: 7 Plan: CNS144

23/11/2022

Queensland Government

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Recent changes

Updated mapping

Updated vegetation mapping was released on 8 September 2022 and includes the most recent Queensland Herbarium scientific updates to the Regulated Vegetation Management Map, regional ecosystems, wetland, high-value regrowth and essential habitat mapping.

The Department of Environment and Science have also updated their protected plant and koala protection mapping to align with the Queensland Herbarium scientific updates.

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

Property details - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s) and catchment(s);

Vegetation management framework - an explanation of the application of the framework and contact details for the Department of Resources who administer the framework;

Vegetation management framework details for the specified Lot on Plan including:

- the vegetation management categories on the property;
- the vegetation management regional ecosystems on the property;
- vegetation management watercourses or drainage features on the property;
- vegetation management wetlands on the property;
- vegetation management essential habitat on the property;
- whether any area management plans are associated with the property;
- whether the property is coastal or non-coastal; and
- whether the property is mapped as Agricultural Land Class A or B;

Protected plant framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework, including:

- high risk areas on the protected plant flora survey trigger map for the property;

Koala protection framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework; and

Koala protection framework details for the specified Lot on Plan including:

- the koala district the property is located in;
- koala priority areas on the property;
- core and locally refined koala habitat areas on the property;
- whether the lot is located in an identified koala broad-hectare area; and
- koala habitat regional ecosystems on the property for core koala habitat areas.

This information will assist you to determine your options for managing vegetation under:

- the vegetation management framework, which may include:
  - exempt clearing work;
  - accepted development vegetation clearing code;
  - an area management plan;
  - a development approval;

- the protected plant framework, which may include:
  - the need to undertake a flora survey;
  - exempt clearing;
  - a protected plant clearing permit;

- the koala protection framework, which may include:
  - exempted development;
  - a development approval;
  - the need to undertake clearing sequentially and in the presence of a koala spotter.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 8 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

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1. Property details

1.1 Tenure and title area

All of the lot, plan, tenure and title area information associated with property Lot: 7 Plan: CNS144, are listed in Table 1.

Table 1: Lot, plan, tenure and title area information for the property

Lot	Plan	Tenure	Property title area (sq metres)
7	CNS144	Lands Lease	25,530,000
AE	SP215968	Easement	167,000
A	CNS122	Easement	222,200
A	CNS65	Easement	159,016
C	SP216045	Easement	11,460

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

1.2 Property location

Table 2 provides a summary of the locations for property Lot: 7 Plan: CNS144, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Isaac Regional

Bioregion(s)	Subregion(s)
Brigalow Belt	Northern Bowen Basin
Brigalow Belt	Isaac - Comet Downs

Catchment(s)
Fitzroy

2. Vegetation management framework (administered by the Department of Resources)

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

2.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify the Department of Resources or obtain an approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 4.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval under the vegetation management framework. For all other land tenures, contact the Department of Resources before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/exemptions.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Exempt clearing work may require approval under other Commonwealth, State or Local Government laws, or local government planning schemes. Contact the Department of Resources prior to clearing in any of these areas.

2.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/codes

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify the Department of Resources before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

2.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

On 8 March 2020, AMPs ended for fodder harvesting, managing thickened vegetation and managing encroachment. New notifications cannot be made for these AMPs. You will need to consider options for fodder harvesting, managing thickened vegetation or encroachment under a relevant accepted development vegetation clearing code or apply for a development approval.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an Area Management Plan applies to your property for which you can make a new notification, it will be listed in Section 3.6 of this report. Before clearing under one of these AMPs, you must first notify the Department of Resources and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/area-management-plans

2.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/development

2.5. Contact information for the Department of Resources

For further information on the vegetation management framework:
Phone 135VEG (135 834)
Email vegetation@resources.qld.gov.au
Visit https://www.resources.qld.gov.au/?contact=vegetation to submit an online enquiry.

3. Vegetation management framework for Lot: 7 Plan: CNS144

3.1 Vegetation categories

The vegetation categories on your property are shown on the regulated vegetation management map in section 4.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 2551.81ha

Vegetation category	Area (ha)
Category B	806.1
Category R	42.0
Category X	1703.7

Table 4: Description of vegetation categories

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact the Department of Resources to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact the Department of Resources to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

The following Property Map of Assessable Vegetation (PMAVs) may be present on this property:

Reference number

2009/009929

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 4.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
11.3.1	Endangered	B	4.38	Acacia harpophylla and/or Casuarina cristata open forest on alluvial plains	Mid-dense
11.3.1	Endangered	R	0.12	Acacia harpophylla and/or Casuarina cristata open forest on alluvial plains	Mid-dense
11.3.2	Of concern	B	26.26	Eucalyptus populnea woodland on alluvial plains	Sparse
11.3.2	Of concern	R	0.74	Eucalyptus populnea woodland on alluvial plains	Sparse
11.3.25	Least concern	B	25.08	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.3.25	Least concern	R	9.08	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.4.8	Endangered	B	134.00	Eucalyptus cambageana woodland to open forest with Acacia harpophylla or A. argyrodendron on Cainozoic clay plains	Sparse
11.4.8	Endangered	R	4.31	Eucalyptus cambageana woodland to open forest with Acacia harpophylla or A. argyrodendron on Cainozoic clay plains	Sparse
11.4.9	Endangered	B	153.65	Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains	Sparse
11.4.9	Endangered	R	4.31	Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains	Sparse
11.5.3	Least concern	B	462.80	Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana woodland on Cainozoic sand plains and/or remnant surfaces	Sparse
11.5.3	Least concern	R	23.44	Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana woodland on Cainozoic sand plains and/or remnant surfaces	Sparse
non-rem	None	X	1,703.69	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.
2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work;
- accepted development vegetation clearing codes;
- performance outcomes in State Code 16 of the State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 4.2.

3.4 Wetlands

There are no vegetation management wetlands present on this property.

3.5 Essential habitat

Under the VMA, essential habitat for protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA) as critically endangered, endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 4.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or
2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
483	Denisonia maculata	ornamental snake	V	Riparian woodland/open forest and shrub/woodland including Brigalow Acacia harpophylla; into drier habitats in summer.	100-450m.	Cracking clay with gilgai/soil crack microrelief and sandy loam substrates.	Near freshwater waterholes/creeks and low lying poorly drained areas that are frequently inundated by freshwater.
1785	Geophaps scripta scripta	squatter pigeon (southern subspecies)	V	Dry eucalypt woodland (including poplar box, spotted gum, yellow box, acacia and callitris), with sparse short grass, often on sandy areas near to permanent water; grassy eucalypt woodlands. Nest on ground near or under grass tussock, log or low bush.	None	None	Gravelly ridges, traprock and river flats.

Label	Regional Ecosystem (mandatory unless otherwise specified)
483	10.3.2, 10.3.3, 10.3.4, 10.3.7, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.27, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.4.6, 10.4.7, 10.4.8, 10.5.5, 10.9.1, 10.9.6, 10.9.7, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.9, 11.3.10, 11.3.12, 11.3.15, 11.3.21, 11.3.23, 11.3.24, 11.3.25, 11.3.27, 11.3.28, 11.3.31, 11.3.34, 11.3.37, 11.3.38, 11.3.40, 11.4.2, 11.4.3, 11.4.4, 11.4.6, 11.4.7, 11.4.8, 11.4.9, 11.4.11, 11.5.2, 11.5.3, 11.5.16, 11.8.11, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.7, 11.9.11, 11.9.12, 11.9.14, 11.11.15, 11.12.6

Label	Regional Ecosystem (mandatory unless otherwise specified)
1785	8.2.1, 8.2.7, 8.2.8, 8.2.12, 8.3.2, 8.3.3, 8.3.5, 8.3.6, 8.3.13, 8.5.2, 8.5.3, 8.5.5, 8.5.6, 8.9.1, 8.11.1, 8.11.3, 8.11.4, 8.11.5, 8.11.6, 8.11.8, 8.12.6, 8.12.7, 8.12.9, 8.12.12, 8.12.14, 8.12.20, 8.12.22, 8.12.23, 8.12.25, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6, 9.3.7, 9.3.8, 9.3.9, 9.3.11, 9.3.13, 9.3.14, 9.3.15, 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.20, 9.3.21, 9.3.22, 9.3.23, 9.4.1, 9.4.2, 9.4.3, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, 9.5.9, 9.5.10, 9.5.11, 9.5.12, 9.5.16, 9.7.1, 9.7.2, 9.7.3, 9.7.5, 9.7.6, 9.8.1, 9.8.2, 9.8.4, 9.8.5, 9.8.6, 9.8.9, 9.8.10, 9.8.11, 9.10.1, 9.10.3, 9.10.6, 9.10.7, 9.10.8, 9.11.1, 9.11.2, 9.11.3, 9.11.4, 9.11.5, 9.11.7, 9.11.10, 9.11.11, 9.11.12, 9.11.13, 9.11.15, 9.11.16, 9.11.17, 9.11.18, 9.11.19, 9.11.23, 9.11.26, 9.11.28, 9.11.29, 9.11.31, 9.11.32, 9.12.1, 9.12.3, 9.12.4, 9.12.5, 9.12.6, 9.12.7, 9.12.10, 9.12.11, 9.12.12, 9.12.13, 9.12.16, 9.12.17, 9.12.18, 9.12.19, 9.12.20, 9.12.21, 9.12.22, 9.12.23, 9.12.24, 9.12.26, 9.12.28, 9.12.30, 9.12.31, 9.12.33, 9.12.35, 9.12.37, 9.12.39, 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.19, 10.3.20, 10.3.27, 10.3.28, 10.3.30, 10.3.31, 10.4.3, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.2, 10.7.3, 10.7.5, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, 10.10.7, 11.2.1, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.23, 11.3.25, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.8, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.4, 11.7.6, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.2, 11.9.3, 11.9.7, 11.9.9, 11.9.14, 11.10.1, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.15, 11.11.16, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.20, 12.2.5, 12.2.6, 12.2.7, 12.2.10, 12.2.11, 12.3.3, 12.3.6, 12.3.10, 12.3.12, 12.3.14, 12.3.18, 12.3.19, 12.5.1, 12.5.2, 12.5.4, 12.5.5, 12.5.7, 12.5.8, 12.5.11, 12.5.12, 12.7.1, 12.7.2, 12.8.14, 12.8.16, 12.8.17, 12.8.19, 12.9-10.5, 12.9-10.7, 12.9-10.8, 12.9-10.12, 12.9-10.13, 12.9-10.25, 12.9-10.26, 12.9-10.28, 12.11.5, 12.11.7, 12.11.8, 12.11.14, 12.11.15, 12.11.20, 12.11.21, 12.11.22, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 12.12.7, 12.12.8, 12.12.9, 12.12.12, 12.12.14, 12.12.21, 12.12.22, 12.12.23, 12.12.24, 12.12.25, 12.12.27, 13.3.1, 13.3.4, 13.3.7, 13.11.1, 13.11.3, 13.11.4, 13.11.8, 13.12.2, 13.12.3, 13.12.5, 13.12.8, 13.12.9, 13.12.10

3.6 Area Management Plan(s)

Nil

3.7 Coastal or non-coastal

For the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP), this property is regarded as*

Non Coastal

*See also Map 4.3

3.8 Agricultural Land Class A or B

The following can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code:

Does this lot contain land that is mapped as Agricultural Land Class A or B in the State Planning Interactive Mapping System?

No Class A

No Class B

Note - This confirms Agricultural Land Classes as per the State Planning Interactive Mapping System only. This response does not include Agricultural Land Classes identified under local government planning schemes. For further information, check the Planning Scheme for your local government area.

See Map 4.4 to identify the location and extent of Class A and/or Class B Agricultural land on Lot: 7 Plan: CNS144.

4. Vegetation management framework maps

Vegetation management maps included in this report may also be requested individually at:
https://www.resources.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form

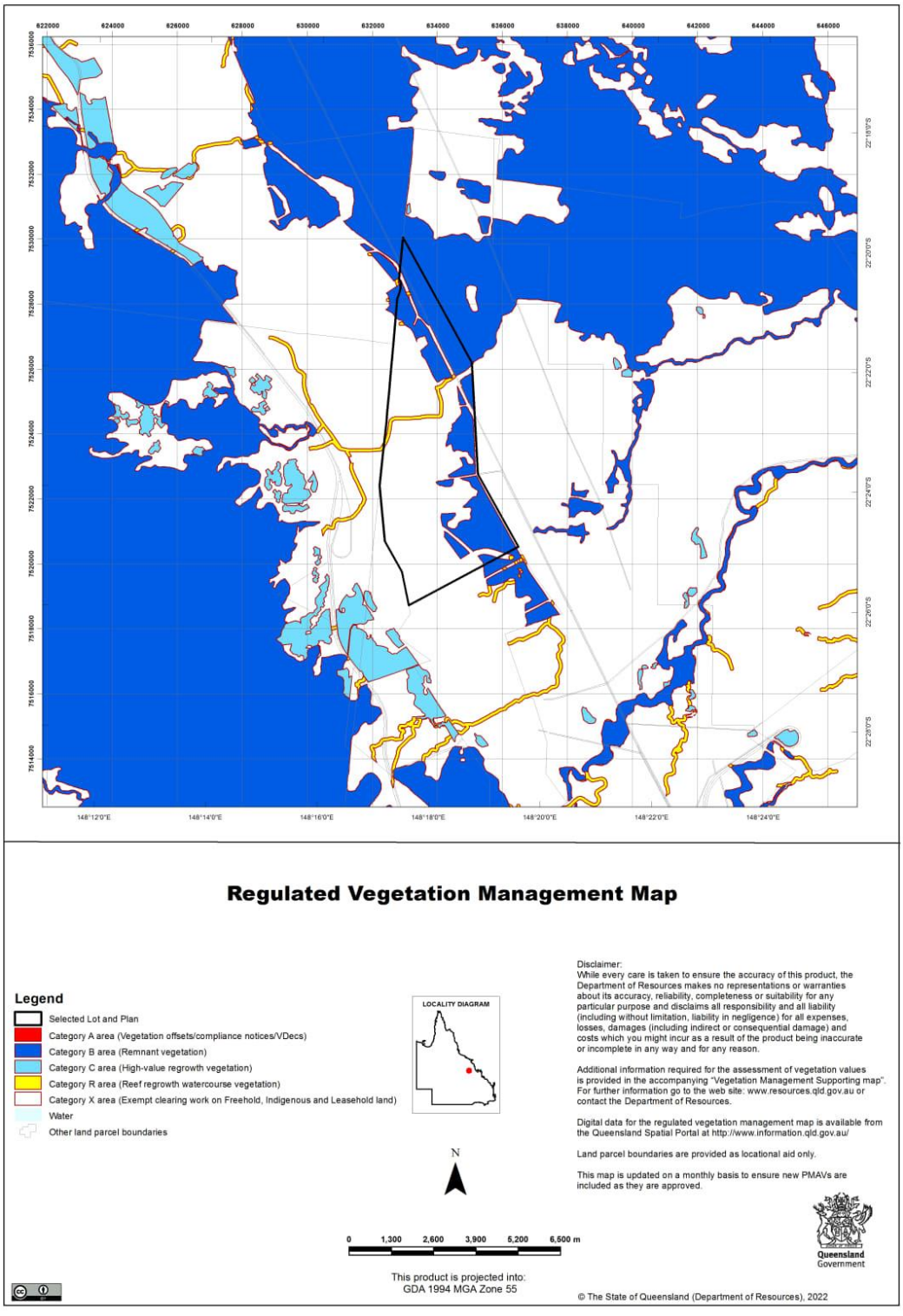
Regulated vegetation management map
The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map
The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

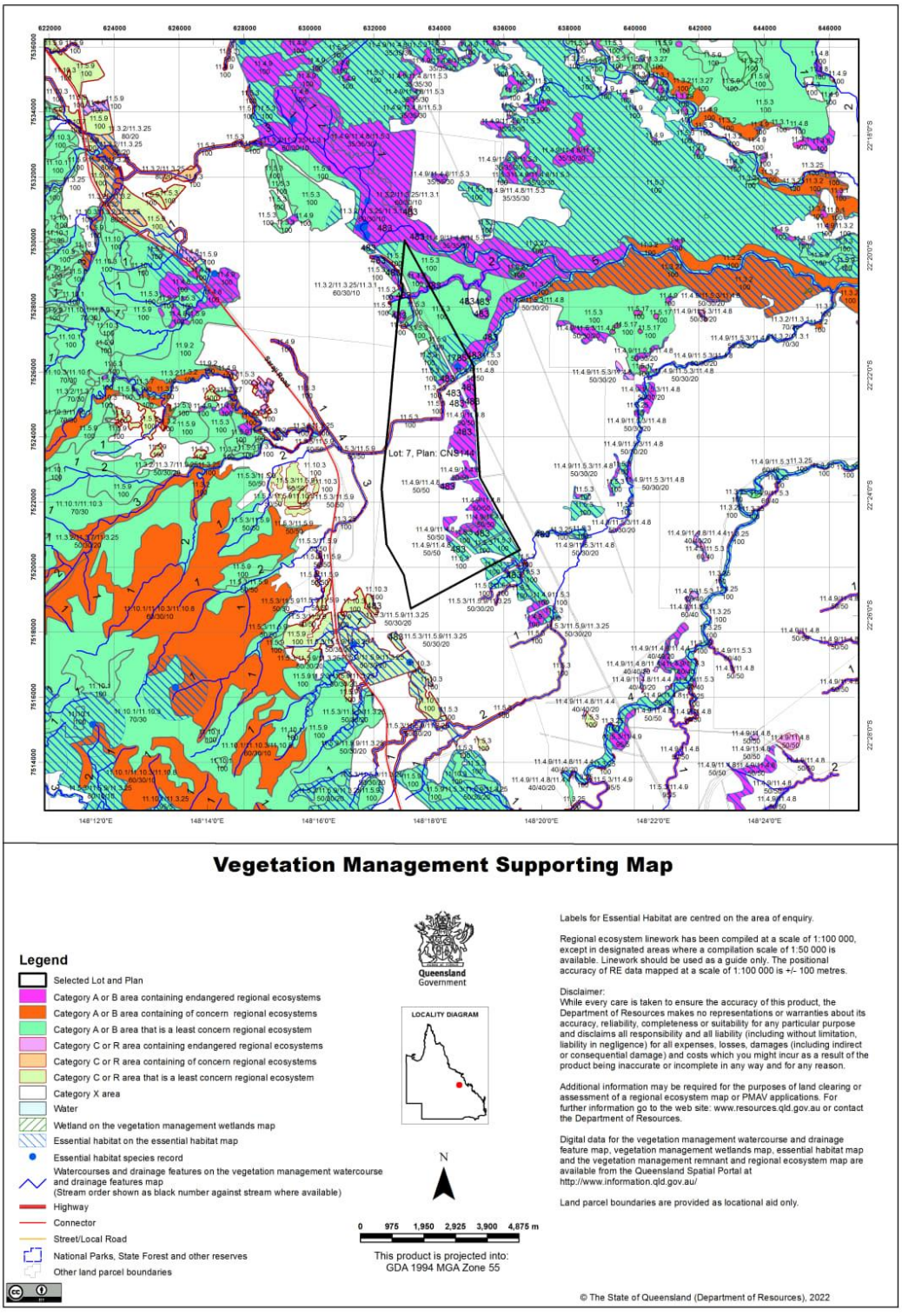
Coastal/non-coastal map
The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP).

Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture
The Agricultural Land Class map confirms the location and extent of land mapped as Agricultural Land Classes A or B as identified on the State Planning Interactive Mapping System. Please note that this map does not include areas identified as Agricultural Land Class A or B in local government planning schemes. This map can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code.

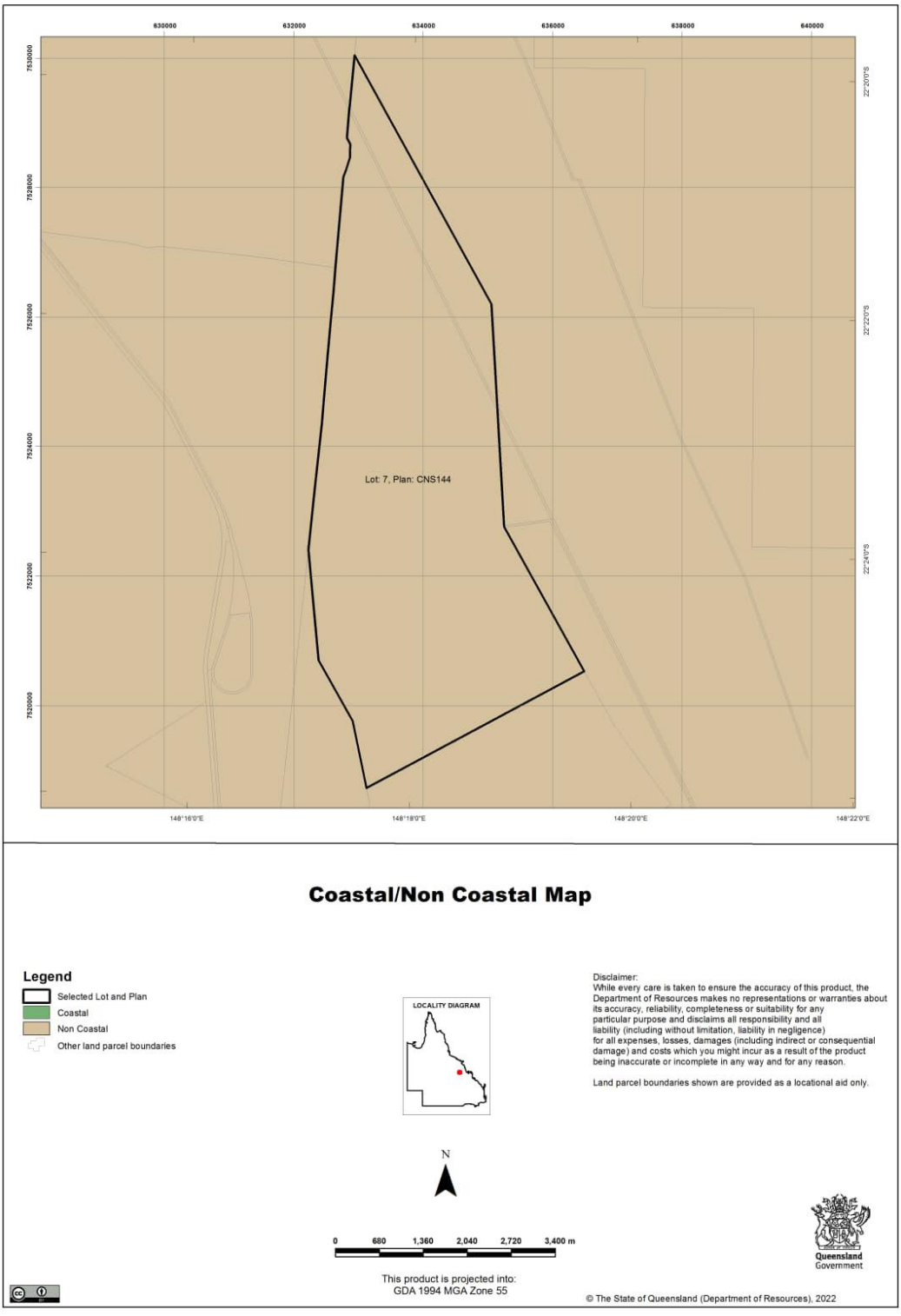
4.1 Regulated vegetation management map



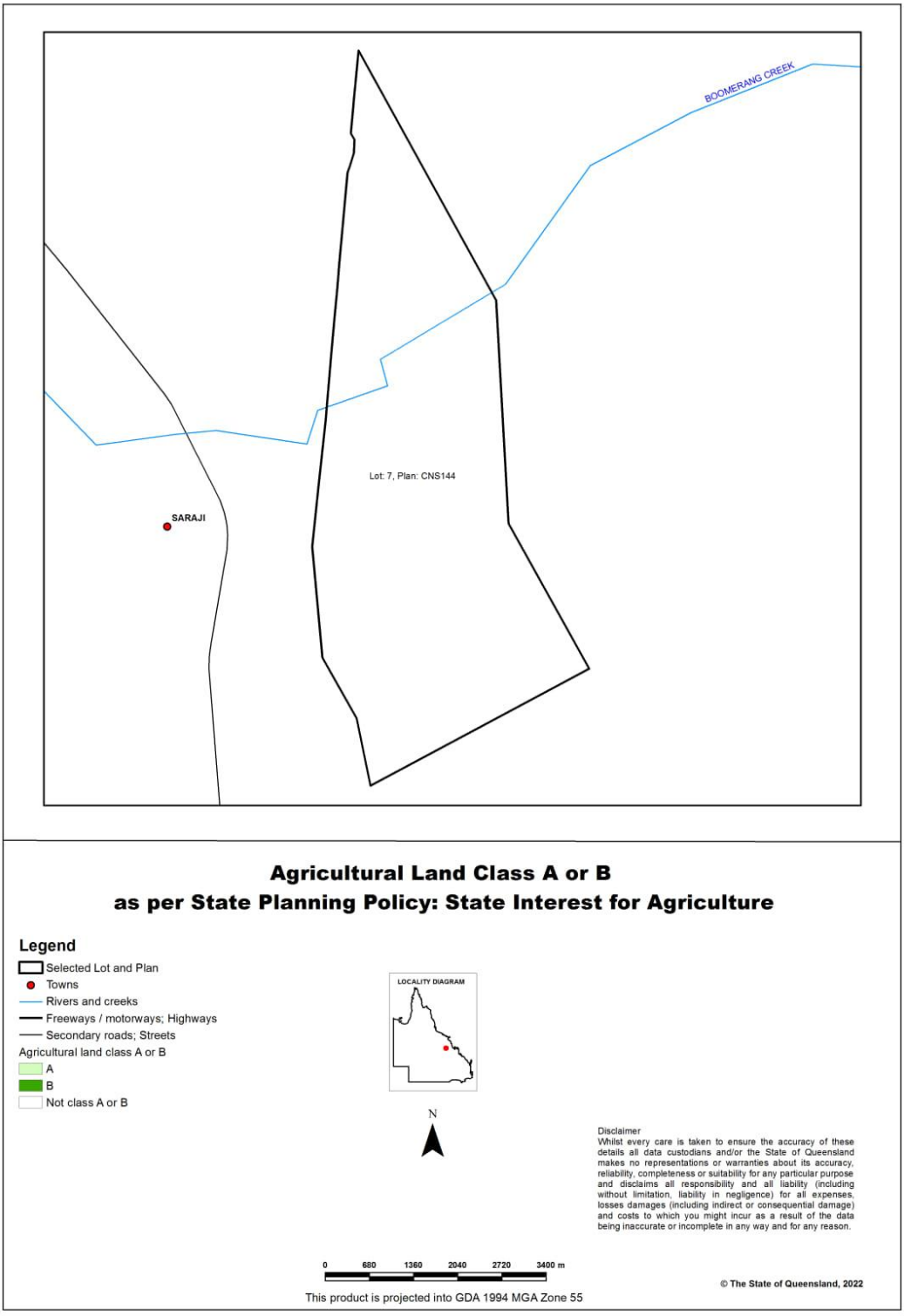
4.2 Vegetation management supporting map



4.3 Coastal/non-coastal map



4.4 Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture



5. Protected plants framework (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA). The NCA regulates the clearing of protected plants 'in the wild' (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') that are listed as critically endangered, endangered, vulnerable or near threatened under the Act.

Please note that the protected plant clearing framework applies irrespective of the classification of the vegetation under the *Vegetation Management Act 1999* and any approval or exemptions given under another Act, for example, the *Vegetation Management Act 1999* or *Planning Regulation 2017*.

5.1 Clearing in high risk areas on the flora survey trigger map

The flora survey trigger map identifies high-risk areas for threatened and near threatened plants. These are areas where threatened or near threatened plants are known to exist or are likely to exist based on the habitat present. The flora survey trigger map for this property is provided in section 5.5.

If you are proposing to clear an area shown as high risk on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken by a suitably qualified person in accordance with the Flora survey guidelines. The main objective of a flora survey is to locate any threatened or near threatened plants that may be present in the clearing impact area.

If the flora survey identifies that threatened or near threatened plants are not present within the clearing impact area or clearing within 100m of a threatened or near threatened plant can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing.

If the flora survey identifies that threatened or near threatened plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the clearing permit application form.

5.2 Clearing outside high risk areas on the flora survey trigger map

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that threatened or near threatened plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

5.3 Exemptions

Many activities are 'exempt' under the protected plant clearing framework, which means that clearing of native plants that are in the wild can be undertaken for these activities with no need for a flora survey or a protected plant clearing permit. The Information sheet - General exemptions for the take of protected plants provides some of these exemptions.

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) under the *Vegetation Management Act 1999* (i.e. listed in Schedule 21 of the Planning Regulations 2017) while some are different.

5.4 Contact information for DES

For further information on the protected plants framework:

Phone 1300 130 372 (and select option four)

Email palm@des.qld.gov.au

Visit https://www.qld.gov.au/environment/plants-animals/plants/protected-plants

5.5 Protected plants flora survey trigger map

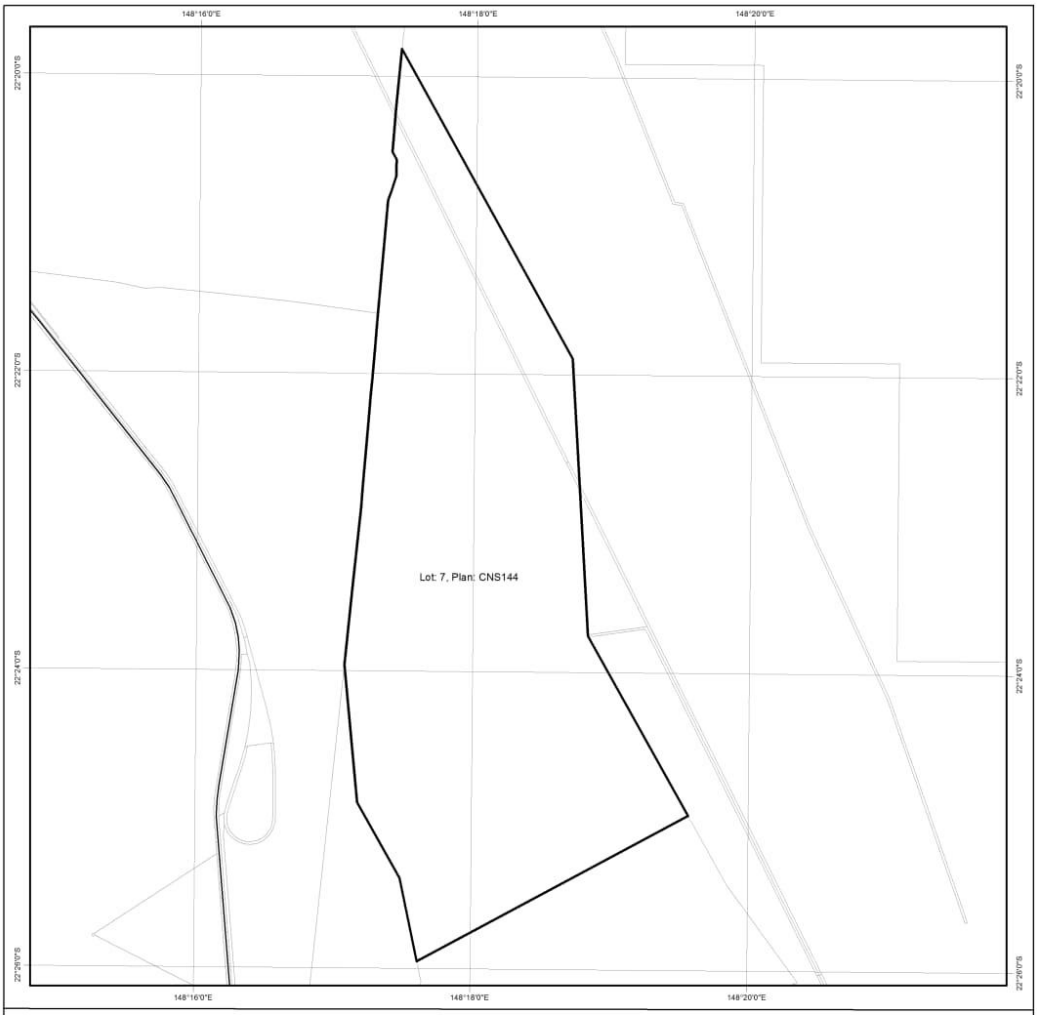
This map included may also be requested individually at: https://apps.des.qld.gov.au/map-request/flora-survey-trigger/.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

Species information

Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the Queensland Spatial Catalogue, the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the clearing of protected plants for more information.



Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

LOCALITY DIAGRAM



N

0 450 900 1,350 1,800 2,250 m

This product is projected into:
GDA 1994 MGA Zone 55

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

Disclaimer:
While every care is taken to ensure the accuracy of the data used to generate this product, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damages) and costs which might be incurred as a consequence of reliance on the data, or as a result of the data being inaccurate or incomplete in any way and for any reason.

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6. Koala protection framework (administered by the Department of Environment and Science (DES))

The koala (*Phascolarctos cinereus*) is listed in Queensland as vulnerable by the Queensland Government under *Nature Conservation Act 1992* and by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Queensland Government's koala protection framework is comprised of the *Nature Conservation Act 1992*, the Nature Conservation (Animals) Regulation 2020, the Nature Conservation (Koala) Conservation Plan 2017, the *Planning Act 2016* and the Planning Regulation 2017.

6.1 Koala mapping

6.1.1 Koala districts

The parts of Queensland where koalas are known to occur has been divided into three koala districts - koala district A, koala district B and koala district C. Each koala district is made up of areas with comparable koala populations (e.g. density, extent and significance of threatening processes affecting the population) which require similar management regimes.
Section 7.1 identifies which koala district your property is located in.

6.1.2 Koala habitat areas

Koala habitat areas are areas of vegetation that have been determined to contain koala habitat that is essential for the conservation of a viable koala population in the wild based on the combination of habitat suitability and biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water). In order to protect this important koala habitat, clearing controls have been introduced into the Planning Regulation 2017 for development in koala habitat areas.

Please note that koala habitat areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley, Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

There are two different categories of koala habitat area (core koala habitat area and locally refined koala habitat), which have been determined using two different methodologies. These methodologies are described in the document Spatial modelling in South East Queensland.

Section 7.2 shows any koala habitat area that exists on your property.

Under the Nature Conservation (Koala) Conservation Plan 2017, an owner of land (or a person acting on the owner's behalf with written consent) can request to make, amend or revoke a koala habitat area determination if they believe, on reasonable grounds, that the existing determination for all or part of their property is incorrect.

More information on requests to make, amend or revoke a koala habitat area determination can be found in the document Guideline - Requests to make, amend or revoke a koala habitat area determination.

The koala habitat area map will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

Changes to the koala habitat area map which occur between annual updates because of a request to make, amend or revoke a koala habitat area determination can be viewed on the register of approved requests to make, amend or revoke a koala habitat area available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/koalamaps. The register includes the lot on plan for the change, the date the decision was made and the map issued to the landholder that shows areas determined to be koala habitat areas.

6.1.3 Koala priority areas

Koala priority areas are large, connected areas that have been determined to have the highest likelihood of achieving conservation outcomes for koalas based on the combination of habitat suitability, biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water) and a koala conservation cost benefit analysis.

Conservation efforts will be prioritised in these areas to ensure the conservation of viable koala populations in the wild including a focus on management (e.g. habitat protection, habitat restoration and threat mitigation) and monitoring. This includes a prohibition on clearing in koala habitat areas that are in koala priority areas under the Planning Regulation 2017 (subject to some exemptions).

Please note that koala priority areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley,

Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

Section 7.2 identifies if your property is in a koala priority area.

6.1.4 Identified koala broad-hectare areas

There are seven identified koala broad-hectare areas in SEQ. These are areas of koala habitat that are located in areas committed to meet development targets in the SEQ Regional Plan to accommodate SEQ's growing population including bring-forward Greenfield sites under the Queensland Housing Affordability Strategy and declared master planned areas under the repealed *Sustainable Planning Act 2009* and the repealed *Integrated Planning Act 1997*.

Specific assessment benchmarks apply to development applications for development proposed in identified koala broad-hectare areas to ensure koala conservation measures are incorporated into the proposed development.

Section 7.2 identifies if your property is in an identified koala broad-hectare area.

6.2 Koala habitat planning controls

On 7 February 2020, the Queensland Government introduced new planning controls to the Planning Regulation 2017 to strengthen the protection of koala habitat in South East Queensland (i.e. koala district A).

More information on these planning controls can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

As a high-level summary, the koala habitat planning controls make:

- development that involves interfering with koala habitat (defined below) in an area that is both a koala priority area and a koala habitat area, prohibited development (i.e. development for which a development application cannot be made);
- development that involves interfering with koala habitat (defined below) in an area that is a koala habitat area but is not a koala priority area, assessable development (i.e. development for which development approval is required); and
- development that is for extractive industries where the development involves interfering with koala habitat (defined below) in an area that is both a koala habitat area and a key resource area, assessable development (i.e. development for which development approval is required).

Interfering with koala habitat means:

1) Removing, cutting down, ringbarking, pushing over, poisoning or destroying in anyway, including by burning, flooding or draining native vegetation in a koala habitat area; but
2) Does not include destroying standing vegetation by stock or lopping a tree.

However, these planning controls do not apply if the development is exempted development as defined in Schedule 24 of the Planning Regulation 2017. More information on exempted development can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

There are also assessment benchmarks that apply to development applications for:

- building works, operational works, material change of use or reconfiguration of a lot where:
  - the local government planning scheme makes the development assessable;
  - the premises includes an area that is both a koala priority area and a koala habitat area; and
  - the development does not involve interfering with koala habitat (defined above); and
- development in identified koala broad-hectare areas.

The Guideline - Assessment Benchmarks in relation to Koala Habitat in South East Queensland assessment benchmarks outlines these assessment benchmarks, the intent of these assessment benchmarks and advice on how proposed development may meet these assessment benchmarks.

6.3 Koala Conservation Plan clearing requirements

Section 10 and 11 of the Nature Conservation (Koala) Conservation Plan 2017 prescribes requirements that must be met when clearing koala habitat in koala district A and koala district B.

These clearing requirements are independent to the koala habitat planning controls introduced into the Planning Regulation 2017, which means they must be complied with irrespective of any approvals or exemptions offered under other legislation.

Unlike the clearing controls prescribed in the Planning Regulation 2017 that are to protect koala habitat, the clearing requirements prescribed in the Nature Conservation (Koala) Conservation Plan 2017 are in place to prevent the injury or death of koalas when koala habitat is being cleared.

6.4 Contact information for DES

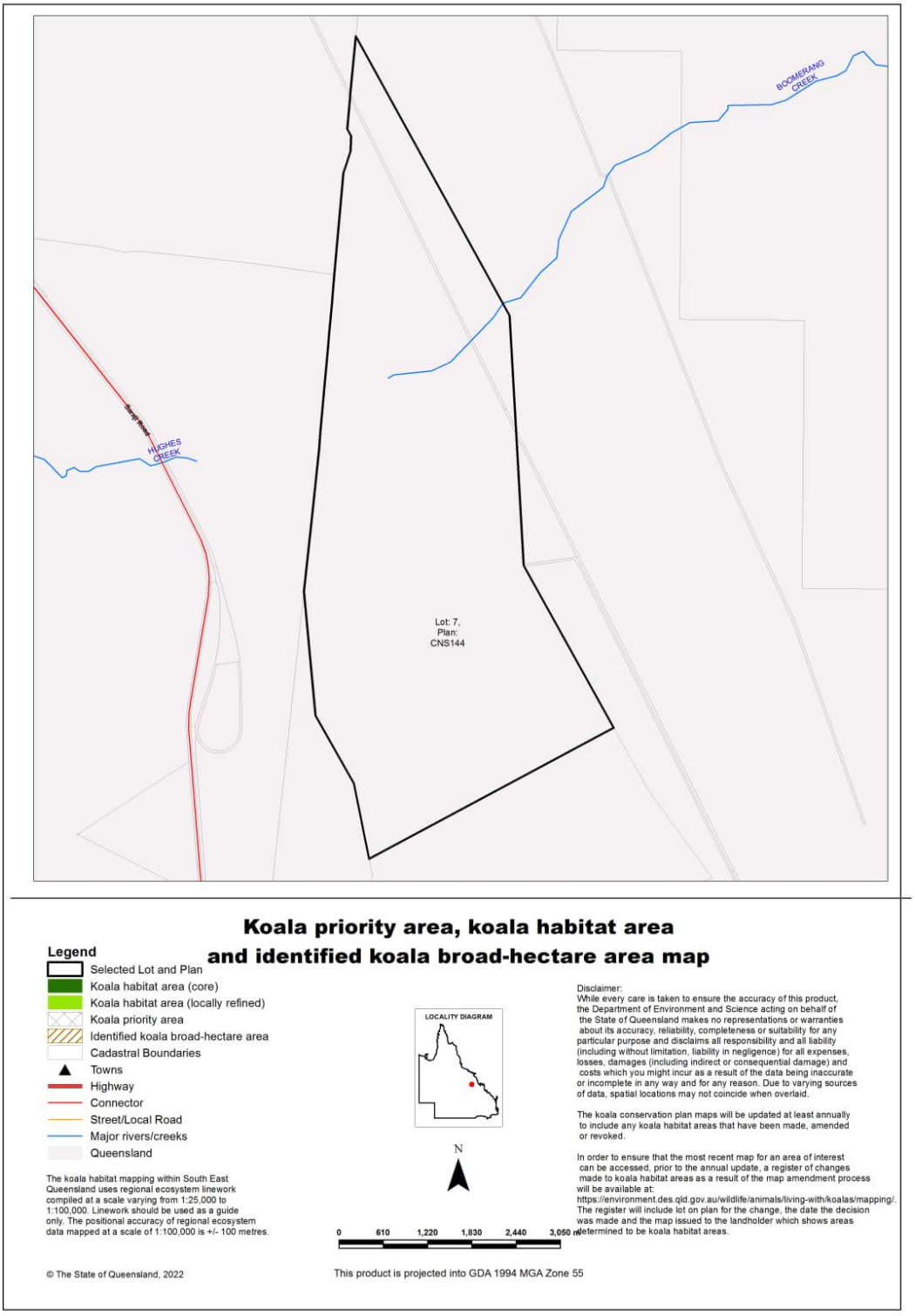
For further information on the koala protection framework:
Phone 13 QGOV (13 74 68)
Email koala.assessment@des.qld.gov.au
Visit https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

7. Koala protection framework details for Lot: 7 Plan: CNS144

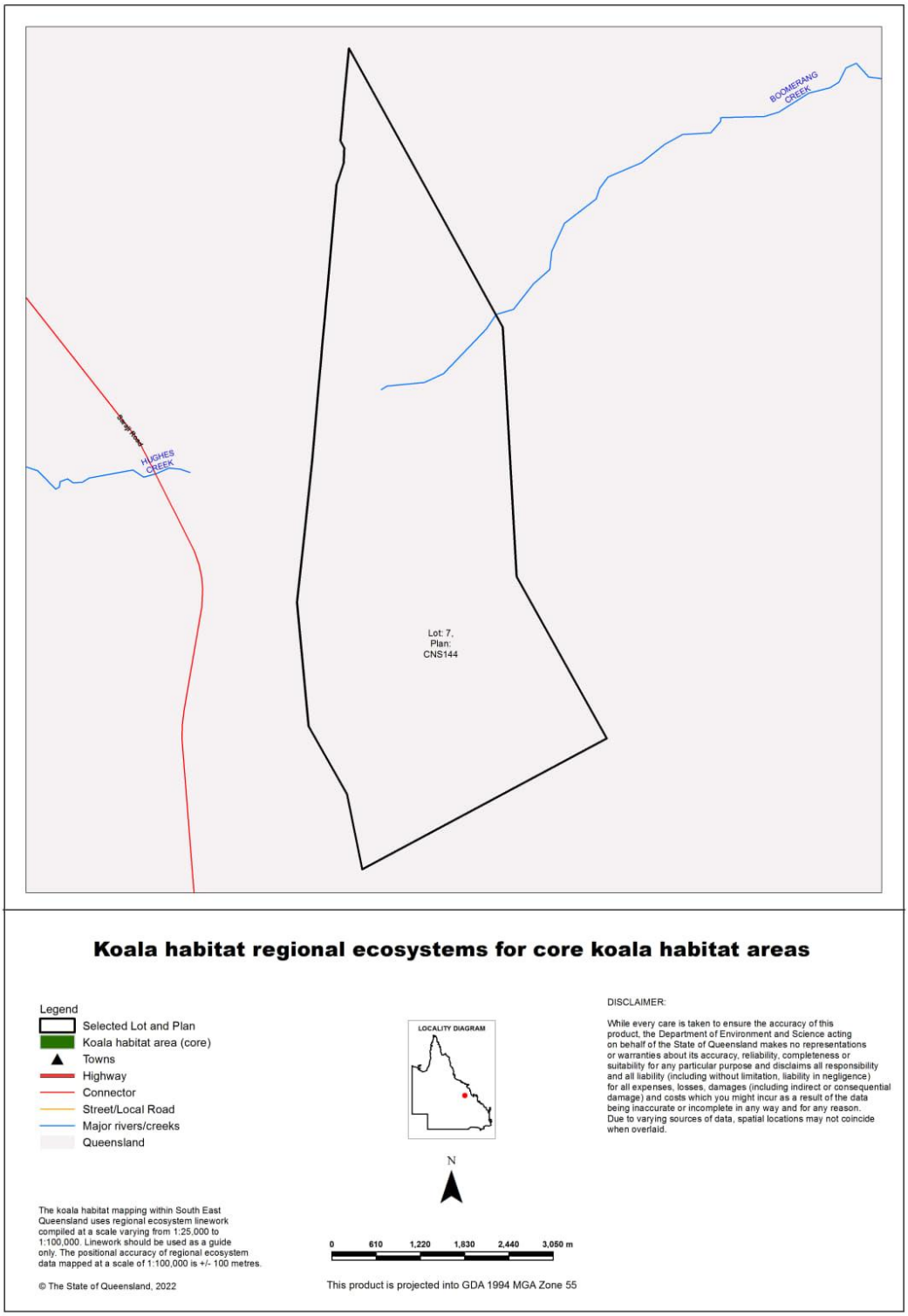
7.1 Koala districts

Koala District C

7.2 Koala priority area, koala habitat area and identified koala broad-hectare area map



7.3 Koala habitat regional ecosystems for core koala habitat areas



8. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
• Interference with overland flow • Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Regional Development, Manufacturing and Water (Queensland Government) Department of Resources (Queensland Government)	Ph: 13 QGOV (13 74 68) www.rdmw.qld.gov.au www.resources.qld.gov.au
• Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
• Mining and environmentally relevant activities • Infrastructure development (coastal) • Heritage issues	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
• Protected plants and protected areas	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 1300 130 372 (option 4) palm@des.qld.gov.au www.des.qld.gov.au
• Koala mapping and regulations	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) Koala.assessment@des.qld.gov.au
• Interference with fish passage in a watercourse, mangroves • Forestry activities on State land tenures	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
• Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of Agriculture, Water and the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
• Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
• Local government requirements	*Local Government Act 2009* *Planning Act 2016*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office
• Harvesting timber in the Wet Tropics of Qld World Heritage area	*Wet Tropics World Heritage Protection and Management Act 1993*	Wet Tropics Management Authority	Ph: (07) 4241 0500 www.wettropics.gov.au

Appendix B

Flora Species List

Family	Genus	Species
Mimosaceae	Acacia	*Acacia angusta*
Mimosaceae	Acacia	*Acacia argyrodendron*
Mimosaceae	Acacia	*Acacia catenulata*
Mimosaceae	Acacia	*Acacia decora*
Mimosaceae	Acacia	*Acacia excelsa*
Mimosaceae	Acacia	*Acacia harpophylla*
Mimosaceae	Acacia	*Acacia holosericea*
Mimosaceae	Acacia	*Acacia leiocalyx*
Mimosaceae	Acacia	*Acacia nilotica**
Mimosaceae	Acacia	*Acacia pendula*
Mimosaceae	Acacia	*Acacia salicina*
Mimosaceae	Acacia	*Acacia shirleyi*
Mimosaceae	Acacia	*Acacia victoriae*
Cactaceae	Acanthocerus	*Acanthocerus pentagonus**
Amaranthaceae	Achyranthes	*Achyranthes aspera*
Fabaceae	Aeschynomene	*Aeschynomene indica*
Sapindaceae	Alectryon	*Alectryon diversifolius*
Sapindaceae	Alectryon	*Alectryon oleifolius*
Sapindaceae	Alectryon	*Alectryon pubescens*
Casuarinaceae	Allocasuarina	*Allocasuarina luehmannii*
Poaceae	Alloteropsis	*Alloteropsis semialata*
Rhamnaceae	Alphitonia	*Alphitonia excelsa*
Apocynaceae	Alstonia	*Alstonia constricta*
Amaranthaceae	Alternanthera	*Alternanthera denticulata*
Amaranthaceae	Alternanthera	*Alternanthera nana*
Lythraceae	Ammannia	*Ammannia multiflora*
Loranthaceae	Amyema	*Amyema quandang*
Poaceae	Ancistrachne	*Ancistrachne uncinata*
Capparaceae	Apophyllum	*Apophyllum anomalum*
#N/A	Aquatic	*Aquatic grass*
Mimosaceae	Archidendropsis	*Archidendropsis basaltica*
Papaveraceae	Argemone	*Argemone ochroleuca**
Poaceae	Aristida	*Aristida benthamii*
Poaceae	Aristida	*Aristida calycina*
Poaceae	Aristida	*Aristida latifolia*
Poaceae	Aristida	*Aristida leptopoda*
Poaceae	Aristida	*Aristida personata*
Aristolochiaceae	Aristolochia	*Aristolochia meridionalis ssp. centralis*
Apocynaceae	Asclepias	*Asclepias curassavica**
Poaceae	Astrebla	*Astrebla elymoides*
Poaceae	Astrebla	*Astrebla pectinata*
Poaceae	Astrebla	*Astrebla squarrosa*
Sapindaceae	Atalaya	*Atalaya hemiglauca*
Chenopodiaceae	Atriplex	*Atriplex muelleri*
Pittosporaceae	Auranticarpa	*Auranticarpa rhombifolia*
Asteraceae	Bidens	*Bidens pilosa*
Nyctaginaceae	Boerhavia	*Boerhavia dominii*
Nyctaginaceae	Boerhavia	*Boerhavia pubescens*
Poaceae	Bothriochloa	*Bothriochloa bladhii*
Poaceae	Bothriochloa	*Bothriochloa decipiens*
Poaceae	Bothriochloa	*Bothriochloa erianthoides*
Poaceae	Bothriochloa	*Bothriochloa ewartiana*
Poaceae	Bothriochloa	*Bothriochloa pertusa**
Sterculiaceae	Brachychiton	*Brachychiton populneus*
Sterculiaceae	Brachychiton	*Brachychiton rupestris*
Phyllanthaceae	Breynia	*Breynia oblongifolia*
Acanthaceae	Brunoniella	*Brunoniella australis*
Asteraceae	Calotis	*Calotis cuneata*
Asteraceae	Calotis	*Calotis scabiosifolia*
Capparaceae	Capparis	*Capparis canescens*
Capparaceae	Capparis	*Capparis lasiantha*
Capparaceae	Capparis	*Capparis loranthifolia*
Capparaceae	Capparis	*Capparis mitchellii*
Capparaceae	Capparis	*Capparis sarmentosa*
Apocynaceae	Carissa	*Carissa lanceolata*
Apocynaceae	Carissa	*Carissa ovata*
Caesalpiniaceae	Cassia	*Cassia brewsteri var. brewsteri*
Casuarinaceae	Casuarina	*Casuarina cristata*
Casuarinaceae	Casuarina	*Casuarina cunninghamiana*
Casuarinaceae	Casuarina	*Casuarina cunninghamiana*
Poaceae	Cenchrus	*Cenchrus ciliaris**
Asteraceae	Centipeda	*Centipeda minima*
Caesalpiniaceae	Chamaecrista	*Chamaecrista mimosoides*
Euphorbiaceae	Chamaesyce	*Chamaesyce dallachyana*

Poaceae	Chloris	*Chloris divaricata*
Poaceae	Chloris	*Chloris gayana**
Poaceae	Chloris	*Chloris inflata*
Poaceae	Chloris	*Chloris truncata*
Poaceae	Chloris	*Chloris ventricosa*
Poaceae	Chloris	*Chloris virgata**
Asteraceae	Chrysocephalum	*Chrysocephalum apiculatum*
Poaceae	Chrysopogon	*Chrysopogon filipes*
Asteraceae	Cirsium	*Cirsium vulgare**
Rutaceae	Citrus	*Citrus glauca*
Vitaceae	Clematicissus	*Clematicissus opaca*
Lamiaceae	Clerodendrum	*Clerodendrum floribundum*
Commelinaceae	Commelina	*Commelina ensifolia*
Convolvulaceae	Convolvulus	*Convolvulus sp.*
Myrtaceae	Corymbia	*Corymbia clarksoniana*
Myrtaceae	Corymbia	*Corymbia dallachyana*
Myrtaceae	Corymbia	*Corymbia erythrophloia*
Myrtaceae	Corymbia	*Corymbia tessellaris*
Amaryllidaceae	Crinum	*Crinum flaccidum*
Fabaceae	Crotalaria	*Crotalaria mitchellii*
Fabaceae	Crotalaria	*Crotalaria novae-hollandiae*
Fabaceae	Crotolaria	*Crotolaria sp.*
Asteraceae	Cyanthillium	*Cyanthillium cinereum*
Orchidaceae	Cymbidium	*Cymbidium canaliculatum*
Poaceae	Cymbopogon	*Cymbopogon obtectus*
Poaceae	Cymbopogon	*Cymbopogon refractus*
Poaceae	Cynodon	*Cynodon dactylon**
Cyperaceae	Cyperus	*Cyperus bifax*
Cyperaceae	Cyperus	*Cyperus difformis**
Cyperaceae	Cyperus	*Cyperus exaltatus*
Cyperaceae	Cyperus	*Cyperus fulvus*
Cyperaceae	Cyperus	*Cyperus gracilis*
Cyperaceae	Cyperus	*Cyperus javanicus*
Cyperaceae	Cyperus	*Cyperus nutans*
Cyperaceae	Cyperus	*Cyperus polystachyos*
Cyperaceae	Cyperus	*Cyperus rotundus**
Cyperaceae	Cyperus	*Cyperus sp.*
Poaceae	Dactyloctenium	*Dactyloctenium radulans*
Loranthaceae	Dendrophthoe	*Dendrophthoe glabrescens*
Celastraceae	Denhamia	*Denhamia cunninghamii*
Celastraceae	Denhamia	*Denhamia oleaster*
Fabaceae	Desmodium	*Desmodium macrocarpum*
Hemerocallidaceae	Dianella	*Dianella longifolia*
Hemerocallidaceae	Dianella	*Dianella sp.*
Poaceae	Dichanthium	*Dichanthium sericeum*
Poaceae	Dichanthium	*Dichanthium setosum*
Poaceae	Digitaria	*Digitaria breviglumis*
Poaceae	Digitaria	*Digitaria brownii*
Poaceae	Digitaria	*Digitaria didactyla*
Poaceae	Digitaria	*Digitaria sp.*
Ebenaceae	Diospyros	*Diospyros humilis*
Acanthaceae	Dipteracanthus	*Dipteracanthus australasicus ssp. corynothecus*
Sapindaceae	Dodonaea	*Dodonaea viscosa*
Poaceae	Echinochloa	*Echinochloa colona*
Boraginaceae	Ehretia	*Ehretia membranifolia*
Chenopodiaceae	Einadia	*Einadia hastata*
Celastraceae	Elaeodendron	*Elaeodendron australe var. integrifolium*
Poaceae	Eleusine	*Eleusine indica**
Chenopodiaceae	Enchylaena	*Enchylaena tomentosa*
Poaceae	Enneapogon	*Enneapogon virens*
Poaceae	Eragrostis	*Eragrostis elongata*
Poaceae	Eragrostis	*Eragrostis lovegrass*
Poaceae	Eragrostis	*Eragrostis sororia*
Scrophulariaceae	Eremophila	*Eremophila bignoniiflora*
Scrophulariaceae	Eremophila	*Eremophila debilis*
Scrophulariaceae	Eremophila	*Eremophila deserti*
Scrophulariaceae	Eremophila	*Eremophila maculata*
Scrophulariaceae	Eremophila	*Eremophila mitchellii*
Cactaceae	Eriocereus	*Eriocereus martinii**
Poaceae	Eriochloa	*Eriochloa crebra*
Poaceae	Eriochloa	*Eriochloa decumbens*
Apiaceae	Eryngium	*Eryngium paludosum*
Fabaceae	Erythrina	*Erythrina vespertilio*
Erythroxylaceae	Erythroxylum	*Erythroxylum australe*
Myrtaceae	Eucalyptus	*Eucalyptus camaldulensis*

Myrtaceae	Eucalyptus	*Eucalyptus cambageana*
Myrtaceae	Eucalyptus	*Eucalyptus coolabah*
Myrtaceae	Eucalyptus	*Eucalyptus crebra*
Myrtaceae	Eucalyptus	*Eucalyptus melanophloia*
Myrtaceae	Eucalyptus	*Eucalyptus microcarpa*
Myrtaceae	Eucalyptus	*Eucalyptus orgadophila*
Myrtaceae	Eucalyptus	*Eucalyptus platyphylla*
Myrtaceae	Eucalyptus	*Eucalyptus populnea*
Myrtaceae	Eucalyptus	*Eucalyptus tereticornis*
Asteraceae	Euchiton	*Euchiton sphaericus*
Euphorbiaceae	Euphorbia	*Euphorbia tannensis ssp. Eremaea*
Laxmanniaceae	Eustrephus	*Eustrephus latifolius*
Convolvulaceae	Evolvulus	*Evolvulus alsinoides*
Convolvulaceae	Evolvulus	*Evolvulus alsinoides*
Moraceae	Ficus	*Ficus opposita*
Cyperaceae	Fimbristylis	*Fimbristylis dichotoma*
Asteraceae	Flaveria	*Flaveria australasica*
Rutaceae	Flindersia	*Flindersia australis*
Rutaceae	Flindersia	*Flindersia dissosperma*
Fabaceae	Galactia	*Galactia tenuiflora*
Rubiaceae	Gardenia	*Gardenia vilhelmii*
Rutaceae	Geijera	*Geijera parviflora*
Phyllanthaceae	Glochidion	*Glochidion ferdinandi*
Fabaceae	Glycine	*Glycine tabacina*
Fabaceae	Glycine	*Glycine tomentella*
Amaranthaceae	Gomphrena	*Gomphrena celosioides**
Proteaceae	Grevillea	*Grevillea parralella*
Proteaceae	Grevillea	*Grevillea striata*
Sparrmanniaceae	Grewia	*Grewia latifolia*
Proteaceae	Hakea	*Hakea lorea*
Haloragaceae	Haloragis	*Haloragis stricta*
Boraginaceae	Heliotropium	*Heliotropium amplexicaule**
Poaceae	Heteropogon	*Heteropogon contortus*
Malvaceae	Hibiscus	*Hibiscus stuartii*
Malvaceae	Hibiscus	*Hibiscus trionum var. vesicarius*
Violaceae	Hybanthus	*Hybanthus*
Violaceae	Hybanthus	*Hybanthus enneaspermus*
Fabaceae	Indigofera	*Indigofera hirsuta*
Fabaceae	Indigofera	*Indigofera linifolia*
Fabaceae	Indigofera	*Indigofera pratensis*
Convolvulaceae	Ipomoea	*Ipomoea lonchophylla*
Convolvulaceae	Ipomoea	*Ipomoea plebeia**
Poaceae	Iseilema	*Iseilema membranaceum*
Oleaceae	Jasminum	*Jasminum lineare*
Juncaceae	Juncus	*Juncus aridicola*
Juncaceae	Juncus	*Juncus usitatus*
Verbenaceae	Lantana	*Lantana camara**
Poaceae	Leptochloa	*Leptochloa decipiens var. decipiens*
Poaceae	Leptochloa	*Leptochloa digitata*
Mimosaceae	Leucaena	*Leucaena leucocephala*
Laxmanniaceae	Lomandra	*Lomandra longifolia*
Laxmanniaceae	Lomandra	*Lomandra multiflora*
Myrtaceae	Lophostemon	*Lophostemon grandiflorus*
Myrtaceae	Lophostemon	*Lophostemon suaveolens*
Fabaceae	Lotus	*Lotus australis*
Caesalpiniaceae	Lysiphyllum	*Lysiphyllum carronii*
Caesalpiniaceae	Lysiphyllum	*Lysiphyllum hookeri*
Fabaceae	Macroptilium	*Macroptilium lathyroides*
Chenopodiaceae	Maireana	*Maireana microphylla*
Apocynaceae	Marsdenia	*Marsdenia pleiadenia*
Apocynaceae	Marsdenia	*Marsdenia viridiflora*
Marsileaceae	Marsilea	*Marsilea hirsuta*
Poaceae	Megathyrsus	*Megathyrsus maximus**
Myrtaceae	Melaleuca	*Melaleuca bracteata*
Myrtaceae	Melaleuca	*Melaleuca fluviatilis*
Myrtaceae	Melaleuca	*Melaleuca leucadendra*
Meliaceae	Melia	*Melia azedarach*
Poaceae	Melinis	*Melinis repens**
Phrymaceae	Mimulus	*Mimulus gracilis*
Pontederiaceae	Monochoria	*Monochoria cyanea*
Commelinaceae	Murdannia	*Murdannia graminea*
Scrophulariaceae	Myoporum	*Myoporum acuminatum*
Mimosaceae	Neptunia	*Neptunia gracilis*
Rubiaceae	Opercularia	*Opercularia sp.*
Cactaceae	Optunia	*Optunia stricta**

Cactaceae	Optunia	*Optunia tomentosa**
Hydrocharitaceae	Ottelia	*Ottelia sp*
Meliaceae	Owenia	*Owenia acidula*
Oxalidaceae	Oxalis	*Oxalis perennans*
Poaceae	Panicum	*Panicum decompositum*
Poaceae	Panicum	*Panicum effusum*
Poaceae	Panicum	*Panicum laevinode*
Poaceae	Panicum	*Panicum queenslandicum*
Poaceae	Panicum	*Panicum simile*
Apocynaceae	Parsonsia	*Parsonsia lanceolata*
Asteraceae	Parthenium	*Parthenium hysterophorus **
Poaceae	Paspalidium	*Paspalidium caespitosum*
Poaceae	Paspalidium	*Paspalidium distans*
Poaceae	Paspalidium	*Paspalidium globoideum*
Poaceae	Paspalidium	*Paspalidium sp.*
Poaceae	Paspalum	*Paspalum dilatatum*
Passifloraceae	Passiflora	*Passiflora foetida**
Passifloraceae	Passiflora	*Passiflora suberosa**
Poaceae	Perotis	*Perotis rara*
Polygonaceae	Persicaria	*Persicaria orientalis*
Polygonaceae	Persicaria	*Persicaria sp*
Picrodendraceae	Petalostigma	*Petalostigma pubescens*
Phyllanthaceae	Phyllanthus	*Phyllanthus maderaspatensis*
Phyllanthaceae	Phyllanthus	*Phyllanthus virgatus*
Pittosporaceae	Pittosporum	*Pittosporum angustifolium*
Pittosporaceae	Pittosporum	*Pittosporum spinescens*
Lamiaceae	Plectranthus	*Plectranthus parviflorus*
Polygalaceae	Polygala	*Polygala sp.*
Polygonaceae	Polygonum	*Polygonum plebeium*
Convolvulaceae	Polymeria	*Polymeria calycina*
Portulacaceae	Portulaca	*Portulaca oleracea*
Portulacaceae	Portulaca	*Portulaca pilosa*
Acanthaceae	Pseuderanthemum	*Pseuderanthemum variable*
Poaceae	Pseudographis	*Pseudographis spinosa*
Rubiaceae	Psydrax	*Psydrax attenuata*
Rubiaceae	Psydrax	*Psydrax johnsonii*
Rubiaceae	Psydrax	*Psydrax odorata*
Dennstaedtiaceae	Pteridium	*Pteridium esculentum*
Fabaceae	Rhynchosia	*Rhynchosia minima*
Acanthaceae	Rostellularia	*Rostellularia adscendens*
Acanthaceae	Rostellularia	*Rostellularia obtusa*
Chenopodiaceae	Salsola	*Salsola kali**
Santalaceae	Santalum	*Santalum acuminatum*
Santalaceae	Santalum	*Santalum lanceolatum*
Apocynaceae	Sarcostemma	*Sarcostemma viminale*
Cyperaceae	Schoenoplectus	*Schoenoplectus litoralis*
Asteraceae	Senecio	*Senecio brigalowensis*
Fabaceae	Sesbania	*Sesbania cannabina**
Poaceae	Setaria	*Setaria sphacelata**
Poaceae	Setaria	*Setaria surgens*
Malvaceae	Sida	*Sida cordifolia**
Malvaceae	Sida	*Sida fibulifera*
Malvaceae	Sida	*Sida filiformis*
Malvaceae	Sida	*Sida rhombifolia**
Malvaceae	Sida	*Sida rohlenae*
Malvaceae	Sida	*Sida subspicata*
Solanaceae	Solanum	*Solanum ellipticum*
Solanaceae	Solanum	*Solanum esuriale*
Poaceae	Sorghum	*Sorghum nitidum*
Poaceae	Sporobolus	*Sporobolus actinocladus*
Poaceae	Sporobolus	*Sporobolus caroli*
Poaceae	Sporobolus	*Sporobolus diandra*
Poaceae	Sporobolus	*Sporobolus mitchellii*
Verbenaceae	Stachytarpheta	*Stachytarpheta jamaicensis**
Orobanchaceae	Striga	*Striga curviflora*
Fabaceae	Stylosanthes	*Stylosanthes hamata**
Fabaceae	Swainsona	*Swainsona galegifolia*
Combretaceae	Terminalia	*Terminalia oblongata*
Combretaceae	Terminalia	*Terminalia ovalifolia*
Poaceae	Themeda	*Themeda quadrivalvens**
Poaceae	Themeda	*Themeda triandra*
Menispermaceae	Tinospora	*Tinospora smilacina*
Aizoaceae	Trianthema	*Trianthema portulacastrum*
Aizoaceae	Trianthema	*Trianthema triquetra*
Zygophyllaceae	Tribulus	*Tribulus terrestris**

Boraginaceae	Trichodesma	*Trichodesma zeylanicum*
Hemerocallidaceae	Tricoryne	*Tricoryne sp.*
Poaceae	Tripogon	*Tripogon loliiformis*
Poaceae	Urochloa	*Urochloa mosambicensis**
Poaceae	Urochloa	*Urochloa panicoides**
Mimosaceae	Vachellia	*Vachellia farnesiana**
Mimosaceae	Vachellia	*Vachellia nilotica**
Rhamnaceae	Ventilago	*Ventilago viminalis*
Asteraceae	Verbesina	*Verbesina encelioides**
Fabaceae	Vigna	*Vigna lanceolata*
Fabaceae	Vigna	*Vigna vexillata*
Campanulaceae	Wahlenbergia	*Wahlenbergia gracilis*
Poaceae	Walwhalleya	*Walwhalleya subxerophila*
Asteraceae	Wedelia	*Wedelia spilanthoides*
Asteraceae	Xanthium	*Xanthium pungens**
Aizoaceae	Zaleya	*Zaleya galericulata**
Fabaceae	Zornia	*Zornia muriculata*

Appendix C

Fauna Species List

Family	Scientific Name	Common name	Source[1]	EPBC Act[2]	NC Act[3]	Incidental AECOM January 2017	River red gum riparian woodland	Eucalyptus and Corymbia open woodland	Dawson gum and brigalow woodland	Brigalow and belah woodland	OXbow wetland	Natural grasslands	Modified grasslands	Shrubby brigalow regrowth with gilgai	Dams	Incidentals	Adjacent to the Project Footprint
Birds																	
Accipitridae	*Accipiter fasciatus*	Brown Goshawk	2007										X			X	
Accipitridae	*Aquila audax*	Wedge-tailed Eagle	2007, 2016, 2017			X	X	X					X			X	
Accipitridae	*Aviceda subcristata*	Pacific baza	2016						X							X	
Accipitridae	*Elanus axillaris*	Black-shouldered Kite	2007, 2016, 2017			X							X			X	
Accipitridae	*Haliastur sphenurus*	Whistling Kite	2007, 2010, 2016, 2017				X	X					X			X	
Accipitridae	*Milvus migrans*	Black Kite	2007, 2010, 2016					X					X			X	
Aegotheliade	*Aegotheles cristatus*	Australian Owlet Nightjar	2007				X				X						
Alaudidae	*Cincloramphus cruralis*	Brown Songlark	2007													X	
Alaudidae	*Cincloramphus mathewsi*	Rufous Songlark	2007													X	
Alaudidae	*Megalurus timoriensis*	Tawny Grassbird	2007									X	X			X	
Anatidae	*Anas gracilis*	Grey Teal	2007, 2010								X				X		
Anatidae	*Anas superciliosa*	Pacific Black Duck	2007, 2010, 2016, 2017				X				X				X	X	
Anatidae	*Aythya australis*	Hardhead	2007												X		
Anatidae	*Cynus atratus*	Black swan	2016												X		
Anatidae	*Dendrocygna arcuata*	Wandering Whistling Duck	2007												X		
Anatidae	*Dendrocygna eytoni*	Plumed Whistling Duck	2007, 2010, 2017								X				X		
Anatidae	*Chenonetta jubata*	Australian Wood Duck	2007, 2010, 2017								X				X		
Anhingidae	*Anhinga melanogaster*	Darter	2007								X				X		
Apodidae	*Apus pacificus*	Fork-tailed Swift	2005	SLC	Mi												X
Apodidae	*Hirundapus caudacutus*	White-throated Needletail	2005	SLC	Mi												X
Ardeidae	*Ardea novaehollandiae*	White-faced Heron	2010, 2016, 2017			X		X	X		X					X	
Ardeidae	*Ardea pacifica*	White-necked Heron	2007, 2010					X			X				X		
Ardeidae	*Ardea intermedia*	Intermedia Egret	2007								X				X		
Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	2010				X										
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	2007, 2017			X		X								X	
Artamidae	*Artamus personatus*	Masked woodswallow	2016									X	X				
Artamidae	*Cracticus torquatus*	Grey Butcherbird	2007, 2017			X				X		X				X	
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	2007, 2010, 2016, 2017			X		X	X			X	X	X		X	
Artamidae	*Gymnorhina tibicen*	Australian Magpie	2007, 2010, 2016, 2017			X	X	X			X					X	
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	2007, 2010, 2016, 2017			X		X	X		X				X		
Cacatuidae	*Eolophus roseicapillus*	Galah	2010, 2016, 2017			X	X	X			X					X	
Cacatuidae	*Nymphicus hollandicus*	Cockatiel	2007										X			X	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo Shrike	2007, 2016, 2017					X					X				
Campephagidae	*Coracina tenuirostris*	Cicadabird	2007				X										
Campephagidae	*Lalage leucomela*	Varied Triller	2007													X	
Casuariidae	*Dromaius novaehollandiae*	Emu	2007, 2016, 2017			X		X								X	
Centropodidae	*Centropus phasianinus*	Pheasant Coucal	2010, 2016, 2017				X				X					X	
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	2007								X				X		
Charadriidae	*Vanellus miles*	Masked Lapwing	2007, 2010, 2016, 2017			X	X	X			X		X		X		
Ciconiidae	*Ephippiorhynchus (Ephippiorhynchus) asiaticus*	Black-necked Stork	2016										X		X		
Climacteridae	*Climacteris affinis*	White-browed Treecreeper	2010								X						
Columbidae	*Geopelia striata*	Peaceful Dove	2007, 2010, 2016				X	X			X					X	
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	2007					X								X	
Columbidae	*Geophaps scripta scripta*	Squatter Pigeon	2010, 2016	V	V			X	X				X			X	
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	2007, 2010					X					X			X	
Columbidae	*Phaps chalcoptera*	Common Bronzewing	2007					X									

Coraciidae	*Eurystomus orientalis*	Dollarbird	2007, 2010, 2016, 2017				X				X			X					
Corcoracidae	*Struthidea cinerea*	Apostlebird	2007, 2010, 2016, 2017			X	X	X									X		
Corvidae	*Corvus orru*	Torresian Crow	2007, 2010, 2016, 2017			X	X	X		X	X	X		X		X	X		
Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	2007														X		
Cuculidae	*Chrysococcyx minutillus*	Little Bronze-Cuckoo	2007														X		
Cuculidae	*Eudynamys scolopacea*	Common Koel	2007, 2010				X	X											
Cuculidae	*Scythrops novaehollandia*	Channel-billed Cuckoo	2007, 2017					X				X							
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	2007					X											
Dicruridae	*Grallina cyanoleuca*	Magpie Lark	2007, 2010, 2016, 2017			X	X	X									X		
Dicruridae	*Rhipidura leucophyrys*	Willie Wagtail	2010, 2016, 2017			X	X	X									X		
Dicruridae	*Rhipidura albiscapa*	Grey fantail	2016				X				X								
Dicruridae	*Rhipidura rufifrons*	Rufous Fantail	2007				X												
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	2007					X											
Falconidae	*Falco berigora*	Brown Falcon	2007, 2016														X		
Falconidae	*Falco cenchroides*	Nankeen Kestrel	2007, 2010, 2016, 2017			X	X				X			X			X		
Falconidae	*Falco hypoleucos*	Grey Falcon	2005	V														X	
Gruidae	*Grus rubicunda*	Brolga	2007, 2010, 2016, 2017			X		X			X						X		
Halcyonidae	*Dacelo leachii*	Blue-winged Kookaburra	2007, 2016				X												
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	2007, 2010, 2016, 2017			X	X	X		X	X			X			X		
Halcyonidae	*Todiramphus macleayii*	Forest Kingfisher	2007, 2016				X				X			X					
Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher	2007, 2010				X												
Hirundinidae	*Hirundo ariel*	Fairy Martin	2007														X		
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	2007, 2010														X		
Laridae	*Hydroprogne caspia*	Caspian tern	2007	SLC	Mi													X	
Maluridae	*Malurus lambertii*	Variegated Fairy-wren	2007				X				X								
Maluridae	*Malurus melanocephalus*	Red-backed Fairy-wren	2007, 2010, 2016, 2017				X	X									X		
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater	2007, 2010, 2016, 2017			X	X	X			X					X	X		
Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	2007														X		
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner	2007					X								X			
Meliphagidae	*Manorian melanocephala*	Noisy Miner	2007, 2010, 2016					X		X	X			X			X		
Meliphagidae	*Philemon citreogularis*	Little Friarbird	2007, 2010				X	X											
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	2007, 2016, 2017			X	X	X			X						X		
Meliphagidae	*Plectorhyncha lanceolata*	Striped Honeyeater	2007					X											
Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	2007					X											
Meropidae	*Merops ornatus*	Rainbow Bee-eater	2007, 2016				X				X								
Motacillidae	*Anthus australis*	Richard's Pipit	2010				X												
Motacillidae	*Anthus novaeseelandiae*	Australasian pipit	2016, 2017			X						X		X			X		
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	2007				X							X					
Oriolidae	*Sphecotheres viridis*	Figbird	2007				X	X											
Otididae	*Ardeotis australis*	Australian Bustard	2010				X							X			X		
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	2007					X		X									
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	2007				X												
Pardalotidae	*Gerygone olivacea*	White-throated Gerygone	2007, 2010, 2016				X	X			X								
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	2007				X												
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	2007, 2016				X	X											
Pardalotidae	*Smicronis brevirostris*	Weebill	2010					X											
Passeridae	*Neochmia modesta*	Plum-headed Finch	2007, 2016											X		X	X		
Passeridae	*Neochmia temporalis*	Red-browed Finch	2007														X		
Passeridae	*Taeniopygia bichenovii*	Double-barred Finch	2007, 2010, 2016					X						X	X		X		
Passeridae	*Taeniopygia guttata*	Zebra Finch	2007, 2016											X			X		

Pelicanidae	*Pelecanus conspicillatus*	Australian pelican	2016								X						
Petroicidae	*Melanodryas cucullata*	Hooded Robin	2007													X	
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	2010								X						
Phalacrocoracidae	*Phalacrocorax melanoleu*	Little Pied Cormorant	2007, 2016, 2017				X				X						
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Black Cormorant	2007												X		
Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	2017								X				X		
Phasianidae	*Coturnix chinensis*	King Quail	2007													X	
Phasianidae	*Coturnix pectoralis*	Stubble Quail	2007										X			X	
Phasianidae	*Coturnix ypsilophora*	Brown quail	2016					X								X	
Podargidae	*Podargus strigoides*	Tawny Frogmouth	2007, 2016, 2017				X		X		X		X				
Podicipedidae	*Tachybaptus novaehollan*	Australasian Grebe	2007												X		
Pomatostomidae	*Pomatostomus temporalis*	Grey-crowned Babbler	2010, 2016, 2017					X	X				X				
Psittacidae	*Aprosmictus erythropterus*	Red-winged Parrot	2007, 2016				X	X					X			X	
Psittacidae	*Platycercus adscitus*	Pale-headed Rosella	2007, 2010, 2016, 2017			X	X	X	X				X			X	
Psittacidae	*Platycercus eximius*	Eastern Rosella	2007					X									
Psittacidae	*Trichoglossus haematodu*	Rainbow Lorikeet	2007, 2010, 2016, 2017				X	X				X	X			X	
Psittacidae	*Trichoglossus chlorolepid*	Scaly-breasted Lorikeet	2007				X	X				X					
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	2007	E	V					X							
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	2005	SLC	Mi												X
Strigidae	*Ninox novaeseelandiae*	Southern Boobook	2007					X			X						
Sturnidae	*Acridotheres tristis*	Common myna	2016													X	
Sylviidae	*Cisticola exilis*	Golden-headed Cisticola	2007				X										
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	2007													X	
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	2007, 2016, 2017			X	X	X			X				X		
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	2007												X		
Threskiornithidae	*Platalea regia*	Royal Spoonbill	2007												X		
Tytonidae	*Tyto alba*	Eastern Barn Owl	2007, 2017				X						X				
Reptiles																	
Agamidae	*Pogona barbata*	Bearded Dragon	2007													X	
Colubridae	*Boiga irregularis*	Brown Tree Snake	2007, 2010				X										
Colubridae	*Dendrelaphis punctulata*	Common Tree Snake	2007				X	X									
Colubridae	*Tropidonophis mairii*	Keelback	2017				X										
Elapidae	*Demansia vestigiata*	Lesser Black Whip Snake	2007													X	
Elapidae	*Densionia maculata*	Ornamental Snake	2009, 2010	V	V					X				X			
Elapidae	*Hoplocephalus bitorquatu*	Pale-headed Snake	2007				X										
Elapidae	*Pseudechis australis*	King Brown Snake	2007													X	
Elapidae	*Pseudonaja textilis*	Eastern Brown Snake	2007, 2016, 2017				X				X		X				
Elapidae	*Furina diadema*	Red-naped Snake	2010					X									
Elapidae	*Suta suta*	Curl Snake	2007													X	
Gekkonidae	*Diplodactylus steindachne*	BoX-patterned Gecko	2007													X	
Gekkonidae	*Gehyra dubia*	Dubious Dtella	2007, 2009, 2010				X	X			X						
Gekkonidae	*Gehyra variegata*	Variegated Tree Dtella	2007, 2010					X									
Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko	2007, 2009, 2010					X		X	X						
Gekkonidae	*Oedura monilis*	Ocellated Velvet Gecko	2007													X	
Gekkonidae	*Strophurus williamsi*	Eastern Spiny-tailed Gecko	2007													X	
Gekkonidae	*Nephrurus levis*	Knob-tailed Gecko	2010										X				
Pythonidae	*Morelia spilota*	Carpet Python	2009							X							
Scincidae	*Carlia pectoralis*	Open-litter rainbow skink	2010										X				
Scincidae	*Cryptoblepharus carnabyi*	Wall Skink	2007, 2010					X									
Scincidae	*Ctenotus robustus*	Eastern Striped Skink	2007, 2010					X		X							
Scincidae	*Ctenotus strauchii*	Eastern Barred Wedgesnout Ctenotus	2007													X	
Scincidae	*Lerista fragilis*	Eastern Mulch-slider	2007													X	
Amphibians																	

Bufonidae	Bufo marinus*	Cane Toad	2007, 2009, 2010, 2016, 2017				X		X		X		X				
Hylidae	Cyclorana brevipes	Short-footed Frog	2007				X						X				
Myobatrachidae	Limnodynastes tasmanien	Spotted Grass Frog	2007, 2009, 2010					X			X				X		
Myobatrachidae	Cyclorana novoholliandae	New Holland Frog	2007, 2010				X								X		
Myobatrachidae	Cyclorana platycephala	Water-holding Frog	2009							X							
Myobatrachidae	Litoria alboguttata	Striped Burrowing Frog	2007, 2009, 2010				X	X		X	X		X				
Myobatrachidae	Litoria caerulea	Green Tree Frog	2007, 2009, 2010, 2016, 2017				X	X	X	X	X		X	X			
Myobatrachidae	Litoria fallax	Eastern Sedge Frog	2007								X				X		
Myobatrachidae	Litoria inermis	Bumpy Rocket Frog	2007, 2009, 2010, 2016				X	X		X	X				X		
Myobatrachidae	Litoria latopalmata	Broad-palmed Rocket Frog	2010								X						
Myobatrachidae	Litoria nasuta	Striped Rocket Frog	2009							X					X		
Myobatrachidae	Platyplectrum ornatum	Ornate Burrowing Frog	2007, 2009, 2010, 2017				X	X		X	X		X				
Myobatrachidae	Litoria rothii	Roth's Tree Frog	2009					X			X						
Myobatrachidae	Litoria rubella	Desert Tree Frog	2007, 2009, 2010, 2016				X	X		X	X						
Mammals																	
Bovidae	Bos taurus*	Cattle	2007													X	
Canidae	Canis familiaris*	Dog	2007													X	
Canidae	Vulpes vulpes*	FoX	2016					X									
Emballonuridae	Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	2007, 2010				X	X			X		X				
Equidae	Equus caballus	Horse (brumby)	2017			X							X			X	
Felidae	Felis cattus*	Cat	2007													X	
Leporidae	Lepus europaeus*	European hare	2007										X			X	
Leporidae	Oryctolagus cuniculus*	European Rabbit	2007, 2016, 2017			X										X	
Macropodidae	Aepyprymnus rufescens	Rufous Bettong	2007, 2017			X							X				
Macropodidae	Macropus giganteus	Eastern Grey Kangaroo	2007, 2010, 2016, 2017			X		X					X		X	X	
Macropodidae	Macropus rufogriseus	Red-necked Wallaby	2017			X		X									
Macropodidae	Wallabia bicolour	Swamp Wallaby	2007				X	X									
Molossidae	Chaerephon jobensis	Greater Northern Freetail Bat	2007, 2016								X						
Molossidae	Mormopterus beccarii	Becari's Free-tailed Bat	2007								X		X				
Molossidae	Mormopterus lumsdenae	Northern Free-tailed Bat	2016								X						
Molossidae	Mormopterus ridei	Ride's Free-tailed Bat	2016								X						
Molossidae	Tadarida australis	White-striped Mastiff Bat	2007													X	
Muridae	Mus musculus*	House Mouse	2007													X	
Peramelidae	Isoodon macrourus	Northern Brown Bandicoot	2007, 2017				X	X									
Phalangeridae	Trichosurus vulpecula	Common Brush-tailed Possum	2007, 2010, 2016, 2017				X	X			X					X	
Phascolarctidae	Phascolarctos cinereus	Koala	2009	V	V												X
Pseudocheiridae	Petauroides volans	Greater Glider	2007, 2010	V			X										
Pteropidae	Pteropus scapulatus	Little Red Flying FoX	2007				X										
Suidae	Sus scrofa*	Pig	2007, 2016					X				X	X		X		
Tachyglossidae	Tachyglossus aculeatus	Short-beaked echidna	2007		SLC											X	
Vespertillionidae	Chalinolobus gouldii	Gould's Wattled Bat	2007, 2016				X	X			X		X				
Vespertillionidae	Chalinolobus morio	Chocolate wattled bat	2016								X						
Vespertillionidae	Chalinolobus picatus	Little pied bat	2016														
Vespertillionidae	Miniopterus schreibersii o	Common Bent-wing Bat	2007				X										
Vespertillionidae	Miniopterus australis	Little Bent-wing Bat	2007														
Vespertillionidae	Myotis macropus	Large-footed Myotis	2007													X	
Vespertillionidae	Scotorepens balstoni	Inland Broad-nosed bat	2016								X						
Vespertillionidae	Scotorepens greyii	Little Broad-nosed Bat	2007, 2016				X				X		X				
Vespertillionidae	Vespadelus baverstocki	Inland forest bat	2016								X						
Vespertillionidae	Vespadelus troughtoni	Eastern Cave Bat	2007								X						

[1] Source: SKM 2007 fauna survey (2007), SKM 2010 fauna survey (2010), EcoServe (2005), EcoServe (2009), AECOM Biodiversit Survey (2016), AECOM Biodiversit Survey (2017)

[2] Conservation status under the Commonwealth EPBC Act: E (endangered), V (vulnerable)

[3] Conservation status under the Queensland NC Act: E (endangered), V (vulnerable), R (rare), NT (near threatened)

* Introduced species

Appendix D

Landscape Fragmentation and Connectivity Tool Output

```
Department of Environment and Science (DES)
Landscape Fragmentation and Connectivity (LFC) Tool version 1.7 LOGFILE
Process started at 04-07-2024 09:56:51 PM
Python version: 3.9.18 [MSC v.1931 64 bit (AMD64)]
Arcpy version: 3.2.2
Username: Admin

INPUT PARAMETERS
Output Workspace: K:\Cameron\E2M\QEJ22058\GTRE\Disturbance
Threshold lookup table: Regional fragmentation local threshold
Remnant cover layer:
K:\Cameron\E2M\QEJ22058\DisturbanceArea\DisturbanceArea.gdb\RegVeg
Cover layer metadata title:Regulated vegetation management map - version 7.04
Remnant cover layer edited: True
Regional buffer extent: 20 kilometres
Local buffer will  be: 5 kilometres
Impact layer:
K:\Cameron\E2M\QEJ22058\DisturbanceArea\DisturbanceArea.gdb\CombinedDisturbanceA
rea
layer projection: GDA_1994_MGA_Zone_55
Raster cell resolution for analysis: 10 metres
Edge Width: 50 metres
(The distance from non-remnant landscapes through to the core ecosystem - the
edge of remnant ecosystems)
Default projection: K:\Cameron\E2M\DP_ENVOFF_LFC_TOOL\lfc_v2p01_arcpro\GDA 2020
Queensland AlbersOFFSET.prj


21:56:51        Checking out the spatial analyst tool - required for LFC

21:56:51        _____________BEGINNING LANDSCAPE FRAGMENTATION AND CONNECTIVITY
ANALYSIS____________

21:56:51        This tool will categorise the landscape into:
{0: 'non-rem', 1: 'patch', 2: 'edge', 3: 'perforated', 4: 'core (< 100
hectares)', 5: 'core (100-500 hectares)', 6: 'core (> 500 hectares)', 7:
'water'}

21:56:52        K:\Cameron\E2M\QEJ22058\GTRE\Disturbance\lyr_file does not
exist, creating it now.
21:56:52        Copying across impact site feature(s) and calculating area in
hectares (AreaHA)
21:56:53        Making a local copy of the impact site
21:56:55        Preparing remnant cover layer for analysis
21:56:57        Created regional scale buffer of 20 kilometres
21:56:59        Created local scale buffer of 5 kilometres
21:57:05        Clipped the remnant cover to the regional buffer extent
21:57:07        Unioned the pre impact remnant layer with the impact site
21:57:10        Attributed the impact area as cleared
21:57:10        Area of RVM Cat B clearing is 183.22 hectares
21:57:10        SQL selection used is RVM_CAT = 'B' and Landcover = 0 on
shapefile
K:\Cameron\E2M\QEJ22058\GTRE\Disturbance\LFC_result.gdb\clip_remcover_post

21:57:10        Categorised the cover attributes in clip_remcover_pre ready for
raster conversion
```

```
21:57:16        Converted clip_remcover_pre to raster

21:57:17        Categorised the cover attributes in clip_remcover_post ready for
raster conversion
21:57:22        Converted clip_remcover_post to raster

21:57:22        Run Landscape fragmentation analysis on the pre impact regional
landscape

REGULATED VEGETATION TYPES BEING EXTRACTED FROM LAND COVER

IDENTIFYING OF CORE, PATCH, EDGE AND PERFORATIONS

COMBINING FRAGMENTATION CLASSES

CLASSIFYING CORE FOREST PATCHES BY AREA

COMPOSING FINAL FRAGMENTATION MAP

FINISHED: COMPOSING FINAL FRAGMENTATION MAP

(FRAGMENTATION CALCULATION TIME WAS 4.2 MINUTES)


22:01:34        Run Landscape fragmentation analysis on the post impact regional
landscape

REGULATED VEGETATION TYPES BEING EXTRACTED FROM LAND COVER

IDENTIFYING OF CORE, PATCH, EDGE AND PERFORATIONS

COMBINING FRAGMENTATION CLASSES

CLASSIFYING CORE FOREST PATCHES BY AREA

COMPOSING FINAL FRAGMENTATION MAP

FINISHED: COMPOSING FINAL FRAGMENTATION MAP

(FRAGMENTATION CALCULATION TIME WAS 4.2 MINUTES)


22:05:49        Extracting a local subset of lfc_regional_pre_impact

22:05:54        Extracting a local subset of lfc_regional_post_impact

22:05:59        Collating pre and post impact statistics and trigger assessment

22:05:59        Summarising area statistics for: lfc_local_pre_impact
22:05:59        Summarising area statistics for: lfc_local_post_impact
22:05:59        Summarising area statistics for: lfc_regional_pre_impact
22:05:59        Summarising patch count for lfc_local_pre_impact
22:06:02        Summarising patch count for lfc_local_post_impact

Analysing impact on Connectivity Areas
```

```
SIGNIFICANCE TEST ONE

The regional total area is 272725.57
The regional extent of core remnant is 114107.86
The regional extent of core remnant is 41.84 percent
This level of regional fragmentation sets a local impact threshold of: 10.0
percent

The table below lists the local impact thresholds for categories of regional
core remnant extent:

REGIONAL CORE CATEGORY         LOCAL IMPACT THRESHOLD
< 10                           2.0
10 - 30                        5.0
30 - 50                        10.0
50 - 70                        20.0
70 - 90                        30.0
>90                            50.0

Area of core at the local scale (pre impact): 13066.81
Area of core at the local scale (post impact): 12833.08
Percent change of core at the local scale (post impact): 1.79 percent

SIGNIFICANCE TEST TWO

The number of core remnant areas occurring on the site: 15
The number of core remnant areas remaining on the site post impact: 10
(Only core polygons greater than or equal to 1 hectare are included)


RESULT

22:06:09        This analysis has determined a SIGNIFICANT impact on
connectivity areas
(A significant reduction in core remnant at the local scale is False OR a change
from core to non-core remnant at the site scale is True)
(Total area of RVM Cat B clearing is 183.22 hectares)

The significance table has been written to:
..\main_output\lfc_significance_assessment.csv
The local scale summary table has been written to:
..\main_output\lfc_local_scale_summary.csv
The site scale summary table has been written to:
..\main_output\lfc_site_scale_summary.csv
GIS layer files copied into folder \lyr_file within the project folder.
View layers in ArcPro
using..\K:\Cameron\E2M\QEJ22058\GTRE\Disturbance\lyr_file\Connectivity Area
Impact Assessment.lyrx

Please scrutinise the output tables and spatial layers to confirm the desktop
modelling of connectivity area impact


This analysis used an edited version of the Regulated Vegetation layer.

22:06:14        _____COMPLETED LANDSCAPE FRAGMENTATION AND CONNECTIVITY
```

ANALYSIS_____