TERRESTRIAL ECOLOGY MNES ASSESSMENT

BMC DRAGLINE MOVE PROJECT

Prepared for
Advisian

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Project Title: BMC Dragline Move Project Terrestrial Ecology MNES Assessment

Project Author/s: Dr Lindsay Popple, Dr Penn Lloyd, Jedd Appleton, Lauren Thorburn (ESP) and Paulette Jones.

Project Summary: An assessment of terrestrial ecology Matters of National Environmental Significance associated with the BMC Dragline Move Project corridor between Goonyella and South Walker Creek Mines north-east of Moranbah.

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Managing Director

EXECUTIVE SUMMARY

Introduction

This report has been prepared by Biodiversity Assessment and Management Pty Ltd (BAAM) for Advisian on behalf of BHP Billiton Mitsui Coal for the purpose of providing an independent terrestrial ecology assessment of Matters of National Environmental Significance (MNES) within a proposed 77 km dragline walk route (the BMC Dragline Move Project 'project area') and surrounds. The route traverses an area between the existing Goonyella and South Walker Creek Mines located outside of Moranbah in central Queensland.

BHP Billiton Mitsui Coal is proposing to utilise the route once only for the purposes of facilitating the dragline move. This assessment of existing terrestrial ecological values is required to inform project planning and approvals.

Methodology

Desktop

Prior to field survey, publicly available information on currently recognised terrestrial ecology values was accessed and reviewed to provide the study team with sufficient background to ensure survey methods were suitably designed to detect and verify the actual values of the study area. Information sourced included: DotEE PMST; Queensland Herbarium Regional Ecosystem (RE) mapping; Regional Ecosystem Description Database (REDD); species profiles and listing advice for MNES; Atlas of Living Australia (ALA) database; Queensland Government WildNet database; and relevant published literature.

Based on the information, an assessment of the likelihood of occurrence of threatened species and communities was carried out to target field assessment for likely or potential species and communities.

Habitat Modelling

The habitat modelling methodology adopted for the project is based broadly on components of the Biodiversity Assessment and Mapping Methodology (BAMM). The components of the BAMM that underpin the habitat mapping methodology of this project are those components that relate specifically to the identification and mapping of habitat of conservation significant species using vegetation units and species records to identify preferred habitat.

The list of REs within the study area was reviewed against the known preferred habitat characteristics of each species, based on a review of the published literature. Any REs not likely to provide preferred habitat for the species were removed from the list. Additional habitat mapping rules were developed for each species where considered relevant, including rules reflecting limits to the species range, sensitivity to habitat fragmentation, differences in likely survey effectiveness between species, and other environmental characteristics related to the ecology of the species that influence its habitat occupancy.

Four habitat type categories were applied to the habitat mapping to reflect habitat: Core habitat; Essential habitat; General habitat; and Unlikely habitat. The model was applied to the existing Regional Ecosystem unit mapping to guide field verification for likely and potential MNES.

Field Surveys

Following the desktop assessment, field surveys were conducted to verify currently recognised terrestrial ecology values, with a particular focus on those values representing the most significant constraints to proposed activities. Field assessments were conducted using best

practice floristic sampling and habitat scoring methodologies, and the survey techniques encompassed community-level vegetation assessments as well as threatened species searches within specific habitats.

Determination of significant species occurrence involved targeted meander searches within each potential habitat type represented within the study area, along with general assessment of habitat features that could potentially support significant species.

Following the field assessments, the vegetation units (REs) on which the fauna habitat modelling and TEC occurrences relied were refined to reflect habitat recorded within the dragline transport route and surrounding areas (500 m either side of the route). The habitat model was then applied using the field-verified mapping.

Results

The study area contains no World Heritage Properties, National Heritage Properties or Wetlands of International Significance. However, from desktop assessment several threatened ecological communities (TECs), threatened species and migratory species are recognised as having potential to occur in the study area.

The presence of seven patches of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC was confirmed in the vicinity of the study area during the field survey.

Despite extensive searches, no signs of potential communities that could represent the Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin were identified during the course of the field surveys within the areas accessed. The extensive impacts of grazing and land management practices encouraging the spread of exotic pasture grasses, including in areas of Cainozoic deposits forming clay pans that would otherwise be suitable for supporting these communities.

The vine thicket TEC was not found in the study area and is considered unlikely to occur.

Following the field survey, no flora species listed as threatened under the EPBC Act are considered known or likely to occur within the study area.

The presence of suitable habitat was confirmed for Squatter Pigeon, Ornamental Snake, Koala and Yakka Skink in the field. Ornamental Snake and Yakka Skink are difficult species to detect outside of intensive field survey effort. As such, the habitat modelling and assessment approach undertaken for this study are designed to identify habitats within which it is predicted the species is present or is likely to be present based on known species distribution, habitat records, available literature and field assessment of the presence of important habitat factors. Habitat quality and condition data were collected at representative locations.

The results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala determined a habitat score of 9. As this score is greater than 5, Koala habitat associated with the study area is recognised as ‘habitat critical to the survival of Koala’ under the EPBC Act referral guidelines.

Squatter Pigeon was observed in several locations within or adjacent to the proposed Dragline route during the field surveys and these locations were added to the data informing the habitat model for the species.

Following the field studies, vegetation mapping within the proposed dragline transport route and surrounds (500 m from dragline transport route centreline) was modified to reflect the recorded conditions.

Impact avoidance

The process for the dragline transport route selection has been an iterative one, with an initial route and investigation buffer provided for appraisal in the ecological desktop assessment and habitat modelling. Feedback for avoidance of potential MNES was provided to project planners and the route was adjusted to minimise the need for clearing of remnant habitats.

A dragline relocation project had occurred over part of the alignment approximately 16 years previously and advice was to constrain the new route to these previously cleared areas wherever possible.

Following field assessment and adjustment of the habitat model to reflect the results of ground-truthing, a further route refinement was undertaken to ensure that the disturbance footprint was minimised.

Total disturbance areas

Derived from the field-verified mapping and modelling results the total areas of MNES values expected to be impacted by the proposed dragline move are provided in the following table. Note that there is considerable overlap of the habitat requirements for the subject species, as well as for the Brigalow TEC. In all, a total of 99.45 ha of habitat that is core or essential habitat for one or more of the subject fauna species will be impacted, 9.7 ha of which also represents the Brigalow TEC.

MNES Value	Area (ha)	Area (ha)[1]			
		Core Habitat	Essential Habitat	General Habitat	Unlikely Habitat
Brigalow TEC	9.7				
Koala		5.38	92.62	1.43	545.67
Squatter Pigeon		64.76	24.44	10.24	545.67
Ornamental Snake		0.28	52.05	18.19	574.58
Yakka Skink		0	99.35	0.1	545.67

Impact Mitigation and Management

Environmental Management Plan(s) will be prepared that incorporate measures to reduce direct and indirect impacts of the Project on MNES values during construction, operation and decommissioning.

Impact Assessment

For the purposes of this impact assessment it is assumed that there will only be reinstatement of riparian vegetation at watercourses along the route, and that the remainder of the route will either (i) be maintained by the landholder/s as a permanent access track or (ii) be stabilised and left to be recolonised by native and/or non-native grasses and other groundcover, tree and shrub species from adjacent areas.

Assessment of the proposed project activities against the relevant EPBC Act guidelines for those MNES confirmed or likely to be present (Brigalow TEC, Ornamental Snake, Yakka Skink, Koala, Squatter Pigeon and Migratory species) finds that the project:

- would reduce the extent of the TEC (9.7 ha) and in accordance with the significant impact criteria, would result in a significant impact.
- would fragment a 13 ha patch of the TEC into two smaller patches, likely resulting in a significant impact.

- could potentially lead to a long-term decrease in the size of an important population of Ornamental Snake, resulting in a significant impact.
- could potentially reduce the area of occupancy of an important population of Ornamental Snake.
- could potentially lead to a long-term decrease in the size of an important population of Yakka Skin, resulting in a significant impact.
- could potentially disrupt the breeding cycle of an important population of Yakka Skink, resulting in a significant impact.

No significant impacts were determined for Koala, Squatter Pigeon or Migratory species.

Environmental Offset Requirements

Where significant impacts on matters of national environmental significance cannot be avoided, mitigated or managed, the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) allows compensation for those impacts through the provision of appropriate environmental offsets.

Along the entire dragline transport route the proposed impact areas that have been assessed as representing 'significant impact' in accordance with the EPBC Act Significant Impact Guidelines 1.1 are:

- 9.7 ha of Brigalow TEC.
- 80.05 ha of "core" and "essential" habitat for Ornamental Snake.
- 99.35 ha of "core" and "essential" habitat for Yakka Skink.

BMC advises that native vegetation located on the South Walker Creek mining leases, inclusive of the identified Brigalow TEC area, is not required to be offset given that BMC has pre-EPBC Act authorisations to clear vegetation within the South Walker Creek mining leases 4750 and 70131. The pre-EPBC Act authorisations date from the grants of the "surface areas" within the mining leases in accordance with the Queensland *Mineral Resources Act 1989*. In this case, the grants occurred in September and October 1996, prior to the commencement of the EPBC Act on 16 July 2000. The South Walker Creek mining leases 4750 and 70131 are also noted on the Environmental Authority EPML00712313 issued under the Queensland *Environmental Protection Act 1994*. As a result, state offsets are not required for any native vegetation cleared on these leases. The pre-EPBC Act authorisation only relates to the 8.5 km eastern section of the route.

Outside of the pre-EPBC Act authorisation areas, the proposed impact areas that have been assessed as representing significant impacts in accordance with the Significant Impact Guidelines 1.1 are:

- 21.6 ha of "core" and "essential" habitat for Ornamental Snake would be cleared for the dragline transport route.
- 60.3 ha of "core" and "essential" habitat for Yakka Skink would be cleared for the dragline transport route.

Note that there is considerable overlap of the habitat requirements for the two reptile species in that this portion of the route.

The preparation of an Offset Strategy is required to identify appropriate offset measures for these species.

BMC DRAGLINE MOVE PROJECT TERRESTRIAL ECOLOGY MNES ASSESSMENT

GOONYELLA TO SOUTH WALKER CREEK, MORANBAH

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Table of Terms and Abbreviations

ALA	Atlas of Living Australia
BAAM	Biodiversity Assessment and Management Pty Ltd
BAMM	Biodiversity Assessment and Mapping Methodology
BMC	Billiton Mitsui Coal
DEHP	Department of Environment and Heritage Protection
DotEE	Department of the Environment and Energy
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESP	Ecological Service Professionals Pty Ltd
MNES	Matters of National Environmental Significance
NC Act	Nature Conservation Act 1992
RE	Regional Ecosystem
SAT	Spot Assessment Technique
SEVT	Semi Evergreen Vine Thicket
TEC	Threatened Ecological Community

1.0 INTRODUCTION

This report has been prepared by Biodiversity Assessment and Management Pty Ltd (BAAM) for Advisian on behalf of BHP Billiton Mitsui Coal for the purpose of providing an independent terrestrial ecology assessment of Matters of National Environmental Significance (MNES) within a proposed 77 km dragline walk route (the BMC Dragline Move Project 'project area') and surrounds. The route traverses an area between the existing Goonyella and South Walker Creek Mines located outside of Moranbah in central Queensland (**Figure 1.1**).

BHP Billiton Mitsui Coal is proposing to utilise the route once only for the purposes of facilitating the dragline move. This assessment of existing terrestrial ecological values is required to inform project planning and approvals.

The specific aims of this assessment are to carry out:

- Desktop assessment of the existing terrestrial ecological values of the project area and surrounds (hereinafter referred to as the "study area").
- Field assessments, as required to verify the currently recognised terrestrial ecological values of the study area.
- Description/ reporting of baseline data.
- Evaluation of the potential impacts of the Project on the terrestrial ecological values of the study area, focusing on species and communities of National significance.
- Description of mitigation measures to avoid, minimise or offset the identified impacts.

All following observations and recommendations are based on a review of available literature and site investigations undertaken by Dr Lindsay Popple and Dr Paul Williams on 18–22 August 2016, and Dr Lindsay Popple, Dr Paul Williams, Ms Shelley Trevaskis and Mr Lui Weber on 29 August – 2 September 2016, inclusive.

Lauren Thorburn of Ecological Service Professionals Pty Ltd (ESP) provided advice regarding two EPBC Act listed threatened turtle species. The assessment was made based on a desktop review and previous experience in the study area.

2.0 METHODOLOGY

2.1 DESKTOP REVIEW

Prior to field survey, publicly available information on currently recognised terrestrial ecology values was accessed and reviewed to provide the study team with sufficient background to ensure survey methods were suitably designed to detect and verify the actual values of the study area. As currently recognised terrestrial ecology values and associated constraints to development are defined at the national level by Commonwealth environmental legislation and partially informed by State vegetation mapping, this included:

- Use of the Department of the Environment and Energy (DotEE) EPBC Act Online Protected Matters Search Tool for determining whether any 'Matters of National Environmental Significance' as defined under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) may occur. In terms of terrestrial ecology, this may include:
  - Threatened Ecological Communities; and
  - Threatened and Migratory species.
- Review of Queensland Herbarium's current, certified Region Ecosystem (RE) mapping to determine which remnant and high-value regrowth vegetation communities and associated habitats for significant flora and fauna species may occur in the study area, including REs that are analogous to EPBC Act-listed Threatened Ecological Communities (TECs).
- Review of the Regional Ecosystem Description Database (Queensland Herbarium 2015), to inform site selection and expected species composition.
- Review of relevant species profiles and Listing Advice for TECs and threatened species.
- Searches of Atlas of Living Australia portal (ALA 2016) and the Queensland Government WildNet database to provide records of terrestrial flora and fauna species known from within 20 km of the edges of the study area.
- Relevant published literature on the terrestrial ecology of the study area, where readily available.

A review of aerial photography and study area boundaries was also undertaken to assist in the determination of suitable representative sampling sites for field surveys.

148°0'E 148°10'E 148°20'E 148°30'E

21°40'S

21°50'S

22°0'S

Goonyella Riverside Mine

South Walker Creek Mine

Red Hill Rd

Goonyella Rd

Peak Downs Hwy

Moranbah

Strathfield

70

67

bing™

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

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0 1,150 2,300 4,600 6,900 9,200 Meters

LEGEND

Dragline Corridor Revision C

Figure:	1.1
Title:	Locality Map
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Drawn By: MG Reviewed by: AC Date: 20-Sep-16

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2.2 HABITAT MODELLING METHODOLOGY

The methodology adopted for the project is based broadly on components of the Biodiversity Assessment and Mapping Methodology (BAMM). The BAMM was developed by the Queensland Government to provide a consistent approach for identifying and mapping biodiversity values at the landscape scale in Queensland using vegetation mapping data generated or approved by the Queensland Herbarium as a fundamental basis (EHP 2014). The components of the BAMM that underpin the habitat mapping methodology of this project are those components that relate specifically to the identification and mapping of habitat of conservation significant species.

2.2.1 Vegetation Units

Vegetation units are the basic mapping unit for the identification of the spatial distribution of different vegetation types that support habitat for fauna species. A vegetation unit is equivalent to a polygon on an RE map approved by the Queensland Herbarium, or a ground-truthed refinement of such a map. Vegetation units may contain one or more REs, and may be identified as either remnant vegetation or mature regrowth vegetation. REs are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. The Queensland Herbarium has developed a methodology for mapping REs across Queensland (Queensland Herbarium 2015). Mature regrowth vegetation is included in the vegetation units for this habitat mapping project since regrowth vegetation, particularly mature regrowth vegetation, has been shown to support equivalent habitat values for reptiles as remnant vegetation (Bruton *et al.* 2013; Bruton and McAlpine 2014) and some threatened bird species (e.g. Squatter Pigeon) and mammal species (e.g. Koala) also use regrowth vegetation. The map of vegetation units used for the project combined a remnant Regional Ecosystem V8 with a State map of proposed high value regrowth vegetation (Category C).

2.2.2 Species Records

Geo-referenced species records were obtained from the following sources:

- The Queensland Wildlife data API online database (Queensland Government 2016);
- The Atlas of Living Australia online database (ALA 2016);
- Additional records of significant species derived from the Queensland Government Essential Habitat mapping (https://www.dnrm.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form); and
- Records of significant species from the field survey for this study (**Section 4.0**).

With the exception of records derived directly from the Queensland Government Essential Habitat mapping, the following filters were applied to these records to identify a set of records for use in the species habitat model development and mapping:

- Only records with an observation or collection date more recent that 1975 were selected;
- Only records with a spatial precision less than or equal to 2,000 m were selected; and
- Any records that did not have a collection/observation date or precision recorded were excluded.

2.2.3 Identification of Preferred Habitat

The list of REs within the study area was reviewed against the known preferred habitat characteristics of each species, based on a review of the published literature. Any REs not likely to provide preferred habitat for the species were removed from the list. Additional habitat mapping rules were developed for each species where considered relevant, including rules reflecting limits to the species range, sensitivity to habitat fragmentation, differences in likely survey effectiveness between species, and other environmental characteristics related to the ecology of the species that influence its habitat occupancy.

Further details on how REs representing preferred habitat were determined for each species are provided in **Section 4.0**.

2.2.4 Habitat Type Categories

Four habitat type categories have been applied to the habitat mapping to reflect habitat types of different value for the management of the subject species.

Core Habitat

Core habitat comprises vegetation units that have been identified as supporting the preferred habitat characteristics of the species (as per the process outlined in **Sections 2.2.3** and **2.2.4**), or which support essential resources (e.g. suitable shelter, major food sources), and which intersect with a buffered record of the species. The buffer adopted for records varied with species, but the minimum buffer corresponded to the lowest precision of the records used. Core habitat represents known habitat for the species.

Essential Habitat

Essential habitat comprises vegetation units that have been identified as supporting the preferred habitat characteristics of the species (as per the process outlined in **Sections 2.2.3** and **2.2.4**), and either of a size capable of supporting at least one breeding unit or likely to be used as an important resource by the species, but which do not intersect with a buffered record of the species and occur within the current known range of the species. Essential habitat represents potential habitat for the species.

General Habitat

General habitat comprises vegetation units that have not been identified as supporting the preferred habitat characteristics of the species (as per the process outlined in **Sections 2.2.3** and **2.2.4**) but include an RE identified as an essential habitat factor for the species by EHP, or that meet the definition of essential habitat but either (a) have been subject to intensive survey using recommended survey techniques and the species has been determined to be absent; or (b) occur outside the current known range of the species (based on published information or records); or (c) where only vagrant individuals have been recorded in the habitat.

Unlikely Habitat

Unlikely habitat comprises non-remnant areas as well as vegetation units that have not been identified as being associated with the species.

2.3 FIELD SURVEYS

Following the desktop assessment, field surveys were conducted to verify currently recognised terrestrial ecology values, with a particular focus on those values representing the most significant constraints to proposed activities. The surveys were conducted on 18–22 August and from 29 August–2 September. Weather at the time of the surveys was mild and mainly dry, with sporadic, light showers. Significant rainfall (>200 mm, BoM (2016), Moranbah airport weather station) over the two months prior to the surveys had promoted significant vegetation growth and facilitated the widespread flowering of numerous species, particularly grasses.

Field assessments were conducted using best practice floristic sampling and habitat scoring methodologies (Neldner *et al*. 2005; DEHP 2014). Survey techniques encompassed community-level vegetation assessments as well as threatened species searches within specific habitats.

The terrestrial flora surveys focused on the verification of remnant and high-value regrowth vegetation community mapping and the associated distribution of Threatened Ecological Communities under the EPBC Act, as well as determining the actual or potential presence of significant terrestrial flora species.

Vegetation communities were ground-truthed through the use of representative sampling of each RE type within the study area to describe vegetation community structure, floristics and condition according to modified Queensland Herbarium methodologies. Wherever possible, this involved the establishment of at least one comprehensive (Biocondition) survey site within each RE, supported by opportunistic, rapid (quaternary) assessments and occasional secondary sites to confirm remnant or regrowth status across the vegetated areas of the study area. This allowed field-verified mapping to be prepared in combination with aerial photo interpretation and delineation to improve the accuracy of the habitat modelling (**Section 2.2**).

Determination of significant species occurrence involved targeted meander searches within each potential habitat type represented within the study area, along with general assessment of

habitat features that could potentially support significant species.

During the survey, all flora species and communities encountered were recorded and searches for significant native species and significant non-native infestations were conducted continuously while traversing the study area.

Fauna habitat assessments were conducted in at least one representative site within each habitat type that could be accessed during the survey across the length of the study area. Habitat assessment included searches for habitat features for Yakka Skink (coarse woody debris and potential burrows) and Ornamental Snake (gilgais, depressions and gully features on Cainozoic plains). Notes were kept on availability of food resources and shelter for Squatter Pigeon. Finally, Spot Assessment Technique (SAT) sites in accordance with the methodology of Biolink Ecological Consultants (2008), and active observations were made in sites that contained potentially suitable habitat for Koala.

In addition to the habitat assessments, timed bird surveys were conducted continuously throughout the survey, along with opportunistic observations on foot and from a vehicle, for Squatter Pigeon.

The locations of ecological assessment sites are shown on **Figure 2.1**.

3.0 DESKTOP RESULTS

The study area contains no World Heritage Properties, National Heritage Properties or Wetlands of International Significance. However, several threatened ecological communities (TECs), threatened species and migratory species are recognised as having potential to occur in the study area.

3.1 VEGETATION COMMUNITIES

The following TECs are identified by DotEE's Protected Matters Search Tool as having potential to occur in the study area:

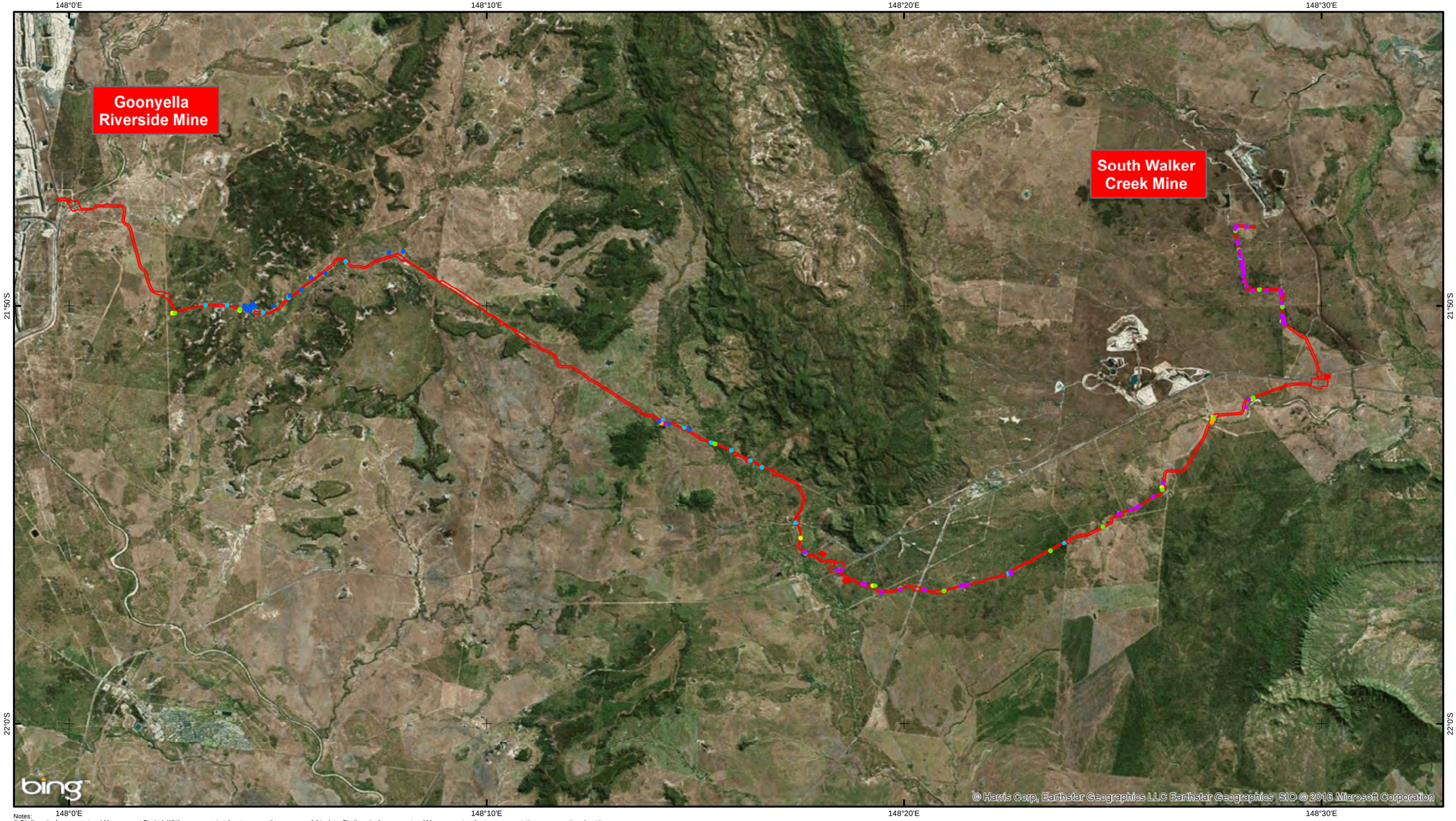
- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions.

Examination of the Queensland Herbarium vegetation mapping and inspection of aerial imagery confirmed the potential for each of the above TECs to occur along the proposed Dragline route. The presence of several REs that equate to the Brigalow TEC, including 11.3.1, 11.9.5 and large instances of 11.4.9, coincide with the proposed route corridor. Notably, areas of unmapped regrowth also have the potential to meet the criteria for inclusion. However, areas of both remnant and regrowth vegetation must also pass the strict condition thresholds to meet the requirements for the TEC, which can only be confirmed by field assessment.

The presence of the Natural Grasslands TEC can be difficult to predict in a desktop assessment. The principal reason for this is that both native and exotic grasslands look virtually identical on aerial imagery and there is a risk that the Queensland Herbarium mapping may have mapped remnant native grasslands as non-remnant for this reason. One grassland RE (11.9.3) that equates to the TEC is mapped within the study area. In addition, the pre-clear mapping indicates this grassland was expected to have been present within the western half of the study area prior to clearing. This highlights the possibility of unmapped remnants being present along the alignment. However, as for the Brigalow TEC, native grasslands must also meet the condition criteria to be recognised as the applicable Natural Grassland TEC.

The Semi-evergreen vine thicket (SEVT) TEC does not have condition criteria. Therefore, any vegetation community that has the necessary structure and species composition for an SEVT community, regardless of its size and condition, would equate to the TEC. Two REs mapped within the study area equate to the SEVT TEC, namely 11.5.15 and 11.9.4. Their presence in the study area required verification as part of the field assessment.

A map showing the location of potential TECs based on Queensland Herbarium mapping of Remnant and High-Value Regrowth is provided in **Figure 3.1**.



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Datum: GDA 1994
Units: Degree

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Ecological Assessment Sites

- Biocondition Survey
- Bird Survey
- MNES Fauna Habitat Assessment
- Quaternary Vegetation Site
- Secondary Vegetation Site
- Threatened Flora Survey

- Dragline_Corridor_RevC
- Temp_Shutdown_Areas

Figure: 2.1
Title: Ecological Assessment Sites

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

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Units: Degree

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0 875 1,750 3,500 5,250 7,000 Meters

LEGEND

Potential Threatened Ecological Community

- Brigalow (Acacia harpophylla dominant and co-dominant)"
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

- Dragline Transport Route
- Temporary Shutdown Areas

Figure:	3.1
Title:	Potential Threatened Ecological Community Locations from DEHP mapping
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

Drawn By: MG Reviewed by: AC Date: 22-Sep-16

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3.2 THREATENED FLORA AND FAUNA

The EPBC Act Protected Matters Search Tool identifies four EPBC Act threatened flora and 16 threatened fauna species as having potential to occur in the study area.

After examination of available literature sources, database records, mapped vegetation communities and aerial imagery across the study area, the following three EPBC Act threatened flora species were considered to have potential to occur:

- King Blue-grass *Dichanthium queenslandicum* (Endangered)
- Blue-grass *Dichanthium setosum* (Vulnerable)
- Black Iron-box *Eucalyptus raveretiana* (Vulnerable).

The following four EPBC Act threatened fauna species were considered likely or to have potential to occur:

- Squatter Pigeon *Geophaps scripta* (Vulnerable)
- Ornamental Snake *Denisonia maculata* (Vulnerable)
- Koala *Phascolarctos cinereus* (Vulnerable)
- Yakka Skink *Egernia rugosa* (Vulnerable).

A full assessment of all relevant threatened flora and fauna MNES, including other species assessed as having low potential or being unlikely to occur, is provided in **Appendix A**.

3.3 MIGRATORY FAUNA

The EPBC Act Protected Matters Search Tool identified six migratory fauna as having potential to occur in the study area. There are records of a further 13 migratory fauna in the broader landscape (ALA 2016). After examination of available literature sources, database records, mapped vegetation communities and aerial imagery across the study area, three migratory fauna are considered to be likely or potential to occur. These include:

- White-throated Needletail *Hirundapus caudacutus*
- Fork-tailed Swift *Apus pacificus*
- Oriental Cuckoo *Cuculus optatus*.

A full assessment of these and all other migratory fauna is provided in **Appendix A**.

4.0 HABITAT MODELLING RESULTS

4.1 ORNAMENTAL SNAKE (*DENISONIA MACULATA*)

4.1.1 Species Profile

Distribution: Ornamental Snake is restricted to the Brigalow Belt Bioregion and is distributed south from around Charters Towers to the Dawson River valley in central coastal Queensland (Department of the Environment 2016).

Habitat and Ecology: Ornamental Snake inhabits low-lying areas with deep-cracking clay soils that are subject to seasonal flooding, and adjacent areas of clay and sandy loams. The species is found in woodlands and shrublands in Brigalow (*Acacia harpophylla*), Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*) or Coolibah (*Eucalyptus coolabah*)-dominated vegetation communities associated with moist areas, particularly gilgaied landscapes. It also occurs in pure grassland associated with gilgais, and lake margins and wetlands (Department of the Environment 2016). The most common RE in which the species has been recorded is RE 11.4.3. It has also been commonly recorded in REs 11.4.6, 11.4.8, 11.4.9, and less commonly recorded in REs 11.3.3 (adjacent to an ephemeral wetland) and 11.5.16 (associated with gilgais) (Department of the Environment 2016a).

Ornamental Snake shelters in soil cracks and under fallen timber. It is a secretive and nocturnal species and feeds almost entirely on frogs. Ornamental Snakes are most frequentlyrecorded in areas with a high abundance of burrowing frogs (*Cyclorana* species). Suitable habitat patches are typically greater than 10 hectares in area and are within, or connected, to larger areas of remnant vegetation. When the soil or topography change, the species can change from being abundant to absent over a few hundred metres. During dry periods, the species typically seeks refuge within the soil cracks of gilgai depressions within the habitat area (Department of the Environment 2016a; Wilson and Swan 2008).

In the study area, REs associated with predominantly cracking clay soils that the species is known to use are summarised in **Table 4.1**. The remaining 17 REs do not occur on cracking clay soils and are therefore not identified as preferred habitat.

Table 4.1. Descriptions of Regional Ecosystems (REs) in the study area providing preferred habitat for Ornamental Snake.

RE code	RE short description
Identified as preferred habitat	
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains with moderately deep to deep cracking clays
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sediments with generally deep texture-contrast and cracking clay soils
Not identified as preferred habitat	
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces
11.7.2	*Acacia* spp. woodland on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts
11.7.3	*Eucalyptus persistens* low open woodland often with a *Triodia mitchellii* ground layer on stripped margins of Cainozoic lateritic duricrust; other scattered eucalypts such as *Corymbia leichhardtii* or *Eucalyptus melanophloia* may also occur.
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland on rises on undulating plains with texture contrast or cracking clay soils
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on gently undulating to undulating plains and rises with cracking clay soils derived from fine-grained sediments
11.9.4a	Semi-evergreen vine thicket on fine-grained sedimentary rocks
11.9.7a	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks

4.1.2 Habitat Modelling Assumptions and Rules

The preferred habitat layer for Ornamental Snake comprises vegetation units of remnant and mature regrowth vegetation of the preferred habitat REs listed in **Table 4.1**, including mixed polygon vegetation units that include any one of the preferred habitat REs listed in **Table 4.1**.

The mapping of habitat for Ornamental Snake within the study area was undertaken applying the following assumptions and rules:

- Core habitat comprises preferred habitat located within a 2 km radius of confirmed records of the species.
- Essential habitat comprises preferred habitat located further than a 2 km radius of confirmed records of the species.
- General habitat comprises remnant and mature regrowth vegetation on Land Zone 3 not identified as preferred habitat.
- Unlikely habitat comprises remnant and mature regrowth vegetation of all REs not listed as preferred habitat REs in **Table 4.1** and not identified general habitat, as well as non-remnant areas.

The pre field-verified habitat modelling results (in hectares) for Ornamental Snake habitat categories in the vicinity of the study area are summarised in **Table 4.2**.

Table 4.2. Summary of the total areas of different habitat categories for Ornamental Snake within 500 m of the centerline of the proposed dragline transport route.

Habitat category	Total area (ha)
Core	4
Essential	1231
General	763
Unlikely	6742
Total area (ha)	8740

4.2 SQUATTER PIGEON (GEOPHAPS SCRIPTA SCRIPTA)

4.2.1 Species Profile

Distribution: The southern subspecies of Squatter Pigeon was historically found from the Burdekin River in central Queensland south to the Dubbo region in New South Wales, and as far west as Longreach, Barcaldine and Charleville. There have been no official records in New South Wales since the 1970s and the species has declined greatly in southern Queensland where it is now very localised (Higgins and Davies 1996; NPWS 2003; Curtis *et al*. 2012). Despite the subspecies having experienced limited recent declines, it occurs broadly and is locally abundant across numerous sites in central Queensland (Garnett *et al*. 2011; Curtis *et al*. 2012).

Habitat and Ecology: Squatter Pigeon is largely terrestrial, foraging and breeding on the ground. The southern subspecies occurs mainly in dry grassy eucalypt woodlands, open forests and scrub that are (Department of the Environment 2016b):

- mostly dominated in the overstorey by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species
- remnant, regrowth or partly modified vegetation communities, and
- within 3 km of a suitable, permanent or seasonal waterbody or watercourse.

It was also reported from open plains in its historical southern range (Frith 1982). Dispersal habitat for the species is any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies; such patches of vegetation facilitate the local movement of the subspecies between patches of foraging habitat, breeding habitat and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or during droughts (Department of the Environment 2016b).

Most birds live in sandy sites near permanent water and are usually seen in pairs or small groups of up to 20 or more birds (Blakers *et al*. 1984). Although they remain common in heavily grazed country in tropical Queensland (Department of the Environment 2016b) they are typically more common in un-grazed land compared to grazed land (Woinarski and Ash 2002). These birds may occasionally feed in sown grasslands and pastures as they eat mainly seeds, particularly legumes, including those of exotic pasture plants, and some insects (Crome 1976; Higgins and Davies 1996). Squatter Pigeons dust-bathe and are often encountered on dirt tracks and in areas of bare soil denuded of ground cover by livestock (Frith 1982; Higgins and Davies 1996). However, the birds do not move far from woodland trees that provide protection from predatory birds, and do not typically forage further than 100 m from remnant trees or patches of wooded habitat (Department of the Environment 2016b).

Regional Ecosystems in the study area that are identified as Essential Habitat factors by EHP for the species are summarised in **Table 4.3** as preferred habitat REs.

4.2.2 Habitat Modelling Assumptions and Rules

The preferred habitat layer for Squatter Pigeon (southern) comprises vegetation units of remnant and/or mature regrowth vegetation of the preferred habitat REs listed in **Table 4.3**, including mixed polygon vegetation units that include any one of the preferred habitat REs listed in **Table 4.3**.

Table 4.3. Descriptions of Regional Ecosystems (REs) in the study area providing preferred habitat for Squatter Pigeon.

RE code	RE short description
Identified as preferred habitat	
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.7.2	*Acacia* spp. woodland on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland on rises on undulating plains with cracking clay or texture contrast soils
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on gently undulating to undulating plains and rises with cracking clay soils derived from fine-grained sediments
11.9.7a	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
Not identified as preferred habitat	
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains with moderately deep to deep cracking clays
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces
11.7.3	*Eucalyptus persistens* low open woodland often with a *Triodia mitchellii* ground layer on stripped margins of Cainozoic lateritic duricrust; other scattered eucalypts such as *Corymbia leichhardtii* or *Eucalyptus melanophloia* may also occur.
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.4a	Semi-evergreen vine thicket on fine-grained sedimentary rocks
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sediments with generally deep texture-contrast soils and cracking clays
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks

The study area occurs within the range of Squatter Pigeon, yet the species is only patchily distributed within its range. The species is relatively conspicuous and is therefore generally encountered during field surveys if it occurs within the area surveyed. To account for the greater effectiveness of surveys for the species as well as its patchy distribution, the mapping of essential habitat (i.e. potential habitat) was restricted to within a 10 km radius of confirmed records of the species.

The mapping of habitat for Squatter Pigeon (southern subspecies) within the study area was undertaken using the following assumptions and rules:

- Core habitat comprises preferred habitat located within a 2 km radius of confirmed records of the species.
- Essential habitat comprises preferred habitat located further than a 2 km radius of confirmed records of the species.
- General habitat comprises remnant and mature regrowth vegetation not identified as core or essential habitat.
- Unlikely habitat comprises non-remnant areas.

The pre field-verified habitat modelling results (in hectares) for Squatter Pigeon (southern subspecies) within the vicinity of the study area are summarised in **Table 4.4**.

Table 4.4. Summary of the total areas of different habitat categories for Squatter Pigeon (southern subspecies) within 500 m of the centerline of the proposed dragline transport route.

Habitat category	Total area (ha)
Core	2167
Essential	1187
General	372
Unlikely	5014
Total area (ha)	8740

4.3 KOALA (PHASCOLARCTOS CINEREUS)

4.3.1 Species Profile

Distribution: Koalas are widely distributed throughout north-east, central and south-east Queensland, extending south through New South Wales and Victoria into South Australia and Kangaroo Island.

Habitat and Ecology: Koalas have a distinct association with eucalypt woodland and forest habitat types containing suitable food trees (Hume and Esson 1993; Moore and Foley 2000; Martin *et al.* 2008), particularly those growing on alluvial or other fertile soils (Moore *et al*. 2004, Crowther *et al.* 2009). They are not necessarily restricted to bushland or remnant areas and are known to occur and breed within farmland and the urban environment (Dique *et al.* 2004). Similarly, movement is not confined to vegetated corridors, as they also move across cleared rural land and through suburbs (Martin *et al.* 2008).

Koalas use a variety of trees, including many non-eucalypts, for feeding and resting (Dique *et al.* 2004; Martin *et al.* 2008). They do, however, have distinct, localised feeding preferences throughout their range, selecting some species in preference to others (Pahl and Hume 1990). Tree species preferences vary around Queensland. At the Blair Athol Coal Mine located approximately 100 km south west of the study area within similar vegetation types Melzer *et. al.* (2014) reported Koala pellets associated with juvenile eucalypts, *Eucalyptus crebra* and *Eucalyptus tereticornis* at higher frequencies than other tree species.

In central Queensland, Koalas typically occur at low density and occupy relatively large home ranges, averaging 101 ha in females and 136 ha in males in the Clermont district (Ellis *et al.* 2002). Regional Ecosystems associated with Koala activity in the Brigalow Belt bioregion include REs on alluvial soils (LZ 3) as well as a range of other land zones (Melzer *et al.* 2014).

Regional Ecosystems in the study area were characterised as preferred habitat for Koala if they included the following tree species (known to be preferred Koala food tree species in central Queensland) as common or dominant components of the tree canopy: *E. camaldulensis, E. coolabah*, *E. crebra, E. orgadophila, E. melanophloia, E. populnea, E. tereticornis* or *E. thozetiana*. This resulted in the recognition of 12 of the REs as preferred habitat REs (**Table 4.5**).

4.3.2 Habitat Modelling Assumptions and Rules

The preferred habitat layer for Koala comprises vegetation units of remnant and/or mature regrowth vegetation of the preferred habitat REs listed in **Table 4.5**, including mixed polygon vegetation units that include any one of the preferred habitat REs listed in **Table 4.5**.

Table 4.5. Descriptions of Regional Ecosystems (REs) in the study area providing preferred habitat for Koala.

RE code	RE short description
Identified as preferred habitat	
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.5.3	*Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.2	*Eucalyptus melanophloia +/- E. orgadophila* woodland on rises on undulating plains with cracking clay or texture contrast soils
11.9.7a	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
Not identified as preferred habitat	
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains with moderately deep to deep cracking clays
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces
11.7.2	*Acacia* spp. woodland on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts
11.7.3	*Eucalyptus persistens* low open woodland often with a *Triodia mitchellii* ground layer on stripped margins of Cainozoic lateritic duricrust; other scattered eucalypts such as *Corymbia leichhardtii* or *Eucalyptus melanophloia* may also occur.
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on gently undulating to undulating plains and rises with cracking clay soils derived from fine-grained sediments
11.9.4a	Semi-evergreen vine thicket on fine-grained sedimentary rocks
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sediments with generally deep texture-contrast soils and cracking clays
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks

The study area occurs within the range of Koala. Therefore, the mapping of habitat for Koala within the study area was undertaken using the following assumptions and rules:

- Core habitat comprises preferred habitat located within a 2 km radius of confirmed records of the species.
- Essential habitat comprises preferred habitat located further than a 2 km radius of confirmed records of the species.
- General habitat comprises remnant and mature regrowth vegetation not identified as core or essential habitat.
- Unlikely habitat comprises non-remnant areas.

The pre field-verified habitat modelling results (in hectares) for Koala in the vicinity of the study area are summarised in **Table 4.6**.

Table 4.6. Summary of the total areas of different habitat categories for Koala within 500 m of the centerline of the dragline transport route.

Habitat category	Total area (ha)
Core	134
Essential	3415
General	143
Unlikely	5048
Total area (ha)	8740

4.4 YAKKA SKINK (*EGERNIA RUGOSA*)

4.4.1 Species Profile

Distribution: Yakka Skink is endemic to Queensland, occurring from Cape York Peninsula to the St George area in the Southern Brigalow Belt (Drury 2001; Wilson 2005; Department of the Environment 2016c).

Habitat and Ecology: Yakka Skink lives in colonies, occupying communal burrows, often in cavities under and between partly buried rocks, logs or tree stumps, root cavities and abandoned animal burrows (Brigalow Belt Reptiles Workshop 2010, Department of the Environment 2016c). The species is extremely cryptic, its presence often confirmed by the presence scat piles (communal latrines) near shelter sites rather than by direct observation, and it may be more common than previously thought, but often overlooked (EPA 2003). The species is patchily distributed, even within extensive areas of apparently suitable habitat. This may result from the species' reliance on either soils suitable for burrowing, availability of large hollow logs for sheltering in and/or presence of rocks and boulders. Furthermore, Yakka Skink is omnivorous, consuming a lot of soft plant materials and fruits, so habitats with diverse shrubs are more suitable than those featuring only grasses (S. Wilson, personal communication). Yakka Skink occurs in a wide variety of vegetation types on a wide variety of Queensland Regional Ecosystem Land Zones (LZ), including alluvium (LZ 3), clay plains (LZ 4), old loamy and sandy plains (LZ 5), ironstone jump-ups (LZ 7), undulating country on fine-grained sedimentary rocks (LZ 9), and sandstone ranges (LZ 10) (Brigalow Belt Reptiles Workshop 2010). It is most commonly associated with woodland and open forest types that include (Brigalow Belt Reptiles Workshop 2010; Department of the Environment 2016c):

- Brigalow (*Acacia harpophylla*)
- Mulga (*A. aneura*)
- Bendee (*A. catenulata*)
- Lancewood (*A. shirleyi*)
- Belah (*Casuarina cristata*)
- Poplar Box (*Eucalyptus populnea*)
- Ironbark (*Eucalyptus* spp.)
- White Cypress Pine (*Callitris glaucophylla*).

Yakka Skink can also occur in cleared non-remnant areas where there are log piles, erosion gullies or rabbit warrens. However, colonies living in cleared non-remnant areas may no longer have access to other colonies, and the potential longevity of individuals may mask the encroaching extirpation of many colonies through genetic isolation.

Regional Ecosystems in the study area were characterised as preferred habitat for Yakka Skink if they included one of the plant species above, along with suitable cover for the species (identified during the field surveys). A conservative approach was applied to habitats identified as being potentially suitable for the species, but which were not visited during the field survey due to access constraints (e.g. RE 11.4.2). These areas were also treated as preferred habitat. This resulted in the recognition of 19 of the REs as preferred habitat REs (**Table 4.7**).

Table 4.7. Descriptions of Regional Ecosystems (REs) associated with Yakka Skink records in the study area.

RE code	RE short description
Identified as preferred habitat	
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains with moderately deep to deep cracking clays
11.5.3	*Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces
11.7.2	*Acacia* spp. woodland on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts
11.7.3	*Eucalyptus persistens* low open woodland often with a *Triodia mitchellii* ground layer on stripped margins of Cainozoic lateritic duricrust; other scattered eucalypts such as *Corymbia leichhardtii* or *Eucalyptus melanophloia* may also occur.
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on gently undulating to undulating plains and rises with cracking clay soils derived from fine-grained sediments
11.9.4a	Semi-evergreen vine thicket on fine-grained sedimentary rocks
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.2	*Eucalyptus melanophloia +/- E. orgadophila* woodland on rises on undulating plains with cracking clay or texture contrast soils
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sediments with generally deep texture-contrast soils and cracking clays
11.9.7a	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks.
Not identified as preferred habitat	
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks

4.4.2 Habitat Modelling Assumptions and Rules

The preferred habitat layer for Yakka Skink comprises vegetation units of remnant and mature regrowth vegetation of the preferred habitat REs listed in **Table 4.7**, including mixed polygon vegetation units that include any one of the preferred habitat REs listed in **Table 4.7**.

The mapping of habitat for Yakka Skink within the study area was undertaken using the following assumptions and rules:

- Core habitat comprises preferred habitat located within a 2 km radius of confirmed records of the species, including in vegetation patches smaller than 30 ha.
- Essential habitat comprises preferred habitat located further than a 2 km radius of confirmed records of the species, restricted to vegetation patches greater than or equal to 30 ha in area.
- General habitat comprises remnant and mature regrowth vegetation not identified as preferred habitat REs for the species.
- Unlikely habitat comprises all other areas.

The pre field-verified habitat modelling results (in hectares) for Yakka Skink within the vicinity of the study area are summarised in **Table 4.8**.

Table 4.8. Summary of the total areas of different habitat categories for Yakka Skink within 500 m of the centerline of the dragline transport route

Habitat category	Total area (ha)
Core	0
Essential	3618
General	82
Unlikely	5040
Total area (ha)	8740

5.0 FIELD SURVEY RESULTS

5.1 VEGETATION COMMUNITIES

The presence of seven patches of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC was confirmed in the vicinity of the study area during the field survey. This included two patches of RE 11.4.9, two large patches of RE 11.9.1 and three small patches of RE 11.9.5. Each of these patches was >0.5 hectares in size and exhibited the structural and condition characteristics of the endangered community.

Additional patches of RE 11.4.9 and RE 11.9.5/11.9.1 were deemed as not corresponding to the TEC due to the absence of Brigalow as a dominant or codominant component of the community. Another patch of brigalow regrowth of appropriate age (>15 years) was identified; however, this patch was dominated with >50% exotic pasture grasses, which excluded this community from representing the TEC. A total area of 190 hectares of this community was identified within a 500 metre buffer of the centreline of the study area following the field survey and after inspection of aerial imagery (**Figure 5.1**).

Despite extensive searches, no signs of potential communities that could represent the Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin were identified during the course of the field surveys within the areas accessed. The extensive impacts of grazing and land management practices encouraging the spread of exotic pasture grasses, including in areas of Cainozoic deposits forming clay pans that would otherwise be suitable for supporting these communities..

The study area contains vegetation mapped by the Queensland Herbarium as RE 11.5.15 and 11.9.4/11.9.5, which could correspond with the Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions community. Ground-truthing of these polygons revealed the former to be RE 11.5.3 (*Eucalyptus populnea* dominated with a subcanopy of *Acacia rhodoxylon*), albeit with some dry rainforest species being successive in the absence of fire in the understorey. Notably, it contained no plants characteristic of RE 11.5.15. The latter was found to contain both RE 11.9.7 (*Eucalyptus populnea* dominated) and RE 11.9.5 (Brigalow community) with no evidence of RE 11.9.4, which could have represented the vine thicket TEC. Therefore, the vine thicket TEC was not found in the study area and is considered unlikely to occur.

Vegetation community assessments for communities that were confirmed as representing a TEC are summarised in **Appendix B**. Sites that were identified as not meeting the criteria for a TEC are summarised in **Appendix C**.

148°0'E 148°10'E 148°20'E 148°30'E

21°50'S

22°0'S

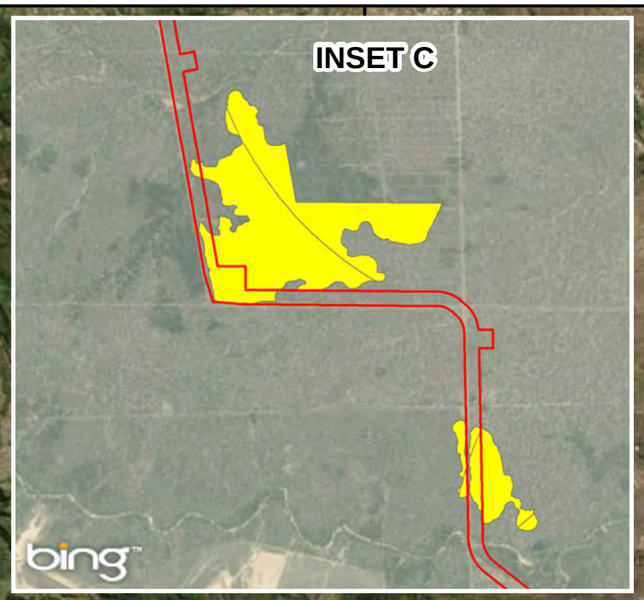
Goonyella Riverside Mine

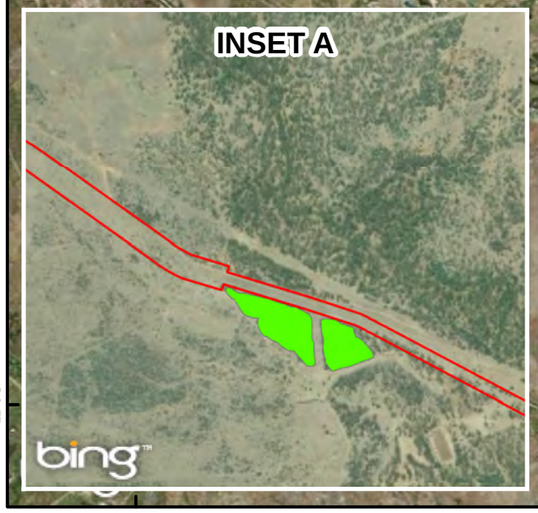
South Walker Creek Mine

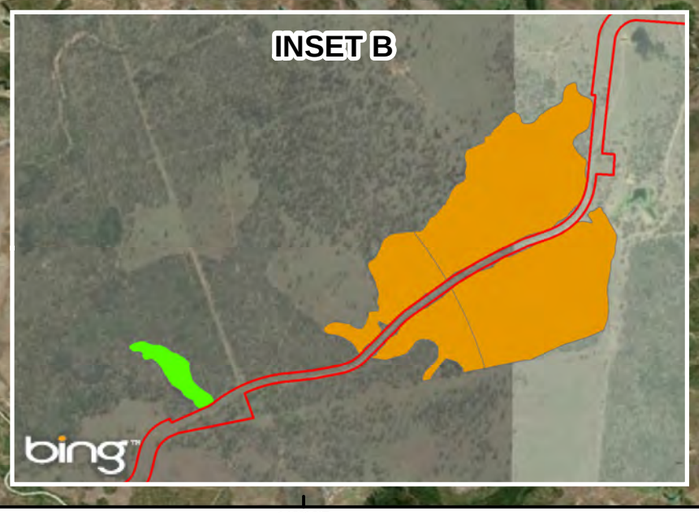
INSET A

INSET B

INSET C







Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:158,835 at A4
0 875 1,750 3,500 5,250 7,000 Meters

LEGEND

Ground-truthed Brigalow TEC

- Brigalow TEC 11.4.9
- Brigalow TEC 11.9.1/11.9.5
- Brigalow TEC 11.9.5

- Dragline Transport Route
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 22-Sep-16

Figure: 5.1
Title: Occurrence of ground-truthed Brigalow TEC within the Dragline Transport Route

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

BAAM ECOLOGICAL CONSULTANTS

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_5_1_Dragline.mxdDate: 22-Sep-16 4:53:56 PM

5.2 FLORA

Following the field survey, no flora species listed as threatened under the EPBC Act are considered known or likely to occur within the study area (**Appendix A, Table A.1**). Two species, *Dichanthium queenslandicum* and *D. setosum,* were considered to have potential to occur in association with Cainozoic deposits forming clay pans, which occur patchily in the southern central and eastern parts of the study area. However, areas with suitable substrates for these grass species were found to be dominated by pasture grasses. It is considered unlikely that these native grass species would (re)colonise and establish in the study area under existing land management practices.

5.3 FAUNA

The presence of suitable habitat was confirmed for Squatter Pigeon, Ornamental Snake, Koala and Yakka Skink in the field. Ornamental Snake and Yakka Skink are difficult species to detect outside of intensive field survey effort. As such, the habitat modelling and assessment approach undertaken for this study are designed to identify habitats within which it is predicted the species is present or is likely to be present based on known species distribution, habitat records, available literature and field assessment of the presence of important habitat factors. Habitat quality and condition data were collected at representative locations.

The results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala (DotE 2014) have been summarised in **Table 5.1**. The total habitat score from this assessment is 9. As this score is greater than 5, Koala habitat associated with the study area is recognised as 'habitat critical to the survival of Koala' under the EPBC Act referral guidelines.

Squatter Pigeon was observed in several locations within or adjacent to the proposed Dragline route during the field surveys and these locations were added to the data informing the habitat model for the species.

Following the field studies, vegetation mapping within the proposed dragline transport route and surrounds (500 m from dragline transport route centreline) was modified to reflect the recorded conditions. For example, where the composition and/or boundaries of an RE polygon were found to be incorrect on the ground, the boundaries and/or attributes were rectified for inclusion in the model. The results of the field-verified modelling within the dragline transport route are provided in **Table 6.1**.

The extents of the modelled and field-verified habitat for these species within the proposed dragline transport route are depicted on a series of six maps for each species in **Appendix D** as follows:

- Figure 5.2a-f Ornamental Snake
- Figure 5.3a-f Squatter Pigeon
- Figure 5.4a-f Koala
- Figure 5.5a-f Yakka Skink

No migratory fauna species were observed during the survey; however, the field assessment was undertaken over late winter/early spring and was therefore outside of the season where the majority of migratory species would be detected. **Appendix A, Table A.2** provides an assessment of the likelihood of migratory species presence and the potential significance of the study area for the species. The study area is not considered to represent important habitat for any EPBC Act listed migratory species.

Table 5.1. Koala habitat assessment tool results summary.

Attribute	Score	Inland area criteria	Score	Assessment details
Koala occurrence	+2	Evidence of one or more Koalas within the last 5 years	2	**Desktop:** • The EPBC Act Protected Matters Search Tool report identified the Koala or Koala habitat as 'known to occur' in the study area; • Database searches (Wildlife Online and Atlas of Living Australia) revealed a single record of Koala within 2 km of the eastern edge of the study area within the last 5 years. **On-ground:** Vegetation communities within the study area were traversed on foot searching for Koala in trees and for scats at the base of food trees. No signs of Koala were observed during the recent survey despite thorough searches across the site, indicating that the local Koala population may occur at a low density in the local landscape.
	+1	Evidence of one or more Koalas within 2 km of the edge of the impact area within the last 10 years		
	0	None of the above		
Vegetation Composition*	+2	Has forest, woodland or shrubland with emerging trees with 2 or more known Koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	2	**Desktop:** • The Queensland Herbarium RE mapping identifies open forest REs dominated by eucalypts occur throughout the study area. **On-ground:** Koala food trees are dominant in the vast majority of remnant vegetation across the study area
	+1	Has forest, woodland or shrubland with emerging trees with only 1 species of known Koala food tree present.		
	0	None of the above		
Habitat connectivity	+2	Area is part of a contiguous landscape ≥ 1000 ha.	2	Parts of the study area are bordered by vast areas of remnant vegetation > 1000 hectares.
	+1	Area is part of a contiguous landscape < 1000 ha but ≥500 ha.		
	0	None of the above		
Key existing threats	+2	Little or no evidence of Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence. Areas which score 0 for Koala occurrence and are likely to have no dog or vehicle threat present.	1	The Peak Downs Highway is prominent in the centre of the study area and many Koala casualties have been recorded to the east (near Nebo). Whilst there is no direct evidence of Koala injury or mortality in the vicinity of the study, this is likely to be an artefact of a low density Koala population in the local landscape providing reduced opportunities for mortality
	+1	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence; **OR** Areas which score 0 for Koala occurrence and are likely to have some degree dog or vehicle threat present.		

Attribute	Score	Inland area criteria	Score	Assessment details
	0	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas with score 0 for Koala occurrence and have a significant dog or vehicle threat present.		
Recovery value **	+2	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DotE 2014).	**2**	In reference to Table 1 of the referral guidelines (DotE 2014), whilst the study area most likely supports a small Koala population, there is ample habitat throughout the study area, which could be considered to contain habitat surrounding habitat refuges and may be important for supporting habitat refuges for Koala to the east. Therefore, the study area is considered likely to be important for achieving the interim recovery objectives for the relevant context as outlined in DotE (2014).
	+1	Uncertain as to whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DotE 2014).		
	0	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DotE 2014).		
Total Score			**9**	As the total score is more than 5, Koala habitat within the study area is recognised as 'habitat critical to the survival of Koala' under the EPBC Act referral guidelines.

** Interim recovery objective in inland areas is to 'protect and conserve the quality and extent of habitat refuges for the persistence of the species during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soil moisture and fertility', and 'maintain the quality, extent and connectivity of large areas of koala habitat surrounding habitat refuges' (DotE 2014).

6.0 MNES IMPACTS

6.1 IMPACT AVOIDANCE

The process for the dragline transport route selection has been an iterative one, with an initial route and investigation buffer provided for appraisal in the ecological desktop assessment and habitat modelling. Feedback for avoidance of potential MNES was provided to project planners and the route was adjusted to minimise the need for clearing of remnant habitats.

A dragline relocation project had occurred over part of the alignment approximately 16 years previously and advice was to constrain the new route to these previously cleared areas wherever possible.

Following field assessment and adjustment of the habitat model to reflect the results of ground-truthing, a further route refinement was undertaken to ensure that the disturbance footprint was minimised.

6.2 TOTAL DISTURBANCE AREAS

The total areas of MNES values expected to be impacted by the proposed dragline move are provided in **Table 6.1**. Note that there is considerable overlap of the habitat requirements for the subject species, as well as for the Brigalow TEC. In all, a total of 99.45 ha of habitat that is core or essential habitat for one or more of the subject fauna species will be impacted, 9.7 ha of which also represents the Brigalow TEC.

In addition, there are locations within the route corridor used for this assessment that are wider than the approximately 40 m required for the dragline move. This assessment is based on the worst case scenario in these locations, and final impacted habitat areas may be less than those provided here.

The total disturbance footprint is approximately 645 ha in area. This represents approximately 7.4% of the broad investigation area over which MNES habitat values have been calculated for the purposes of this assessment (approximately 8740 ha). The broad investigation area is defined by a buffer of 500 m around the centreline of the proposed dragline transport route.

Table 6.2 provides a comparison of the MNES habitat areas within the dragline transport route with habitat present within the surrounding 500 m buffer.

Table 6.1 Field-verified MNES fauna habitat modelling results.

MNES Value	Area (ha)[1]	Area (ha)			
		Core Habitat	Essential Habitat	General Habitat	Unlikely Habitat
Brigalow TEC	9.7				
Koala		5.38	92.62	1.43	545.67
Squatter Pigeon		64.76	24.44	10.24	545.67
Ornamental Snake		0.28	52.05	18.19	574.58
Yakka Skink		0	99.35	0.1	545.67

Table 6.2. Comparison of impacted MNES habitat within surrounding habitat extents.

MNES	Estimated habitat extent within 500m of the dragline transport route centreline (ha)	Potential core and essential habitat impacted within dragline transport route (ha)	Estimated habitat remaining within 500m of the dragline transport route centreline (ha)	Estimated % habitat impacted within 500m of the dragline transport route centreline
Endangered Ecological Community				
Brigalow	190	9.7	180.3	5.1
Vulnerable Species[1]				
Koala	3549	98	3451	2.8
Ornamental Snake	1235	52.3	11824.5	4.2
Squatter Pigeon	3354	89.2	3254.8	2.6
Yakka Skink	3618	99.35	3516	2.7

[1] Estimates are the sum area of core and essential habitat (see **Table 6.1**).

6.3 IMPACT MITIGATION AND MANAGEMENT

Environmental Management Plan(s) will be prepared that incorporate measures to reduce direct and indirect impacts of the Project on MNES values.

Specifically, the following measures will be included:

Pre-construction:

- Pre-clear fauna surveys will be undertaken to identify, investigate and flag the following habitat features within the dragline transport route:
  - Fallen timber and burrows, including rabbit burrows that may support Yakka Skink colonies.
  - Areas of cracking clay soils that may support Ornamental Snakes.
  - Squatter Pigeon nests.

Construction:

- Progressive demarcation (by temporary fencing) of remnant vegetation and habitats adjoining the dragline transport corridor within which no construction activity, machinery, stockpiles or equipment storage can occur.
- Presence of a Fauna Spotter/Catcher during clearing activities, with specific focus on habitat features flagged during pre-construction pre-clear surveys and any vegetation that may support Koalas. The activities of the Fauna Spotter/Catcher will be guided by the applicable Environmental Management Plan and a Species Management Program (required under the Queensland *Nature Conservation Act 1992*) designed to minimise impacts on animal breeding places. Clearing and soil disturbance techniques will be outlined to unearth Yakka Skink colonies (if confirmed or suspected to be present), and retrieve sheltering Ornamental Snakes from soil cracks.
- Protection of habitats adjacent to the dragline transport route from:
  - Soil erosion and sedimentation.
  - Dust from disturbed soil and materials stockpiles, to be detailed in an Environmental Management Plan.
  - Weed introduction and or spread, with prevention, management and monitoring detailed in an Environmental Management Plan.
  - Leakages and accidental spills from construction machinery/equipment and refuelling activities, with prevention and management actions to be detailed in an Environmental Management Plan.

Operation:

The operation of the dragline transport roadway will be a once-off move of the dragline from Goonyella Riverside Mine to South Walker Creek Mine. It will take approximately 10 weeks for the move to take place, during which time there is potential for ecological impacts to adjacent habitats from activity along the route during the move. The temporary fencing erected during the construction phase to flag important habitats adjacent to the roadway must remain in place throughout the dragline move and any disturbance within these areas is to be avoided.

Decommissioning:

Once the Dragline move is complete, the route will be decommissioned. Ideally, those areas that currently support remnant vegetation and high value regrowth as mapped by the Queensland Government would be treated and managed to encourage regeneration of the original vegetation community types. As it is not proposed to use infill material for the transportation route, the natural ground surface will remain reasonably intact. Preparation of the ground surface could include removal and stockpiling of topsoil and cleared vegetation for re-spreading in areas identified for restoration. Such actions would encourage the regrowth of the native vegetation from the existing seed bank, although regular monitoring and management of weed infestations would be needed as the disturbed and exposed soil will be susceptible to the establishment of exotic species.

As the route is located predominantly within lands not owned, leased or managed by the proponent, plans for vegetation restoration will be subject to agreement with the various landholders. However, it will be necessary to rehabilitate all waterway crossings, ensuring the reinstatement of riparian vegetation and bank stability. This may include a variety of measures such as:

- Soil ripping followed by seeding
- Planting of seedlings
- Application of erosion control blanket combined with seeding or planting

- Application of propriety erosion control revegetation blankets or similar products.

To increase their effectiveness, revegetation measures should be tailored to the type and density of vegetation existing at each crossing and the medium-term predicted weather patterns.

The details of the rehabilitation and restoration actions for the dragline transportation route will be included within a Rehabilitation and Restoration Management Plan for the Project.

For the purposes of this impact assessment it is assumed that there will only be reinstatement of riparian vegetation at watercourses along the route, and that the remainder of the route will either (i) be maintained by the landholder/s as a permanent access track or (ii) be stabilised and left to be recolonised by native and/or non-native grasses and other groundcover, tree and shrub species from adjacent areas.

6.4 IMPACT ASSESSMENT

An assessment of the potential for the proposed Dragline Move Project to result in Significant Impacts on matters of national environmental significance has been undertaken against the Significant Impact Guidelines 1.1 (Department of the Environment, 2013) and is provided in full in **Appendix E**.

The individual assessments of impacts take into account the short term nature of the project and the implementation of the proposed mitigation and management measures.

6.4.1 Threatened Ecological Communities

Table E.1, Appendix E addresses impacts on the Endangered Brigalow (*Acacia harpophylla* dominant and co-dominant communities) occurring within the dragline transport corridor. The assessment finds that clearing for the Project:

- would reduce the extent of the TEC (9.7 ha) and in accordance with the significant impact criteria, would result in a significant impact.
- would fragment a 13 ha patch of the TEC into two smaller patches, likely resulting in a significant impact.

6.4.2 Ornamental Snake

Table E.2, Appendix E addresses impacts on the Vulnerable Ornamental Snake. Given that the species is patchily distributed in the landscape, it must be considered that there is potential for the population in the study area to be an important population. The assessment finds that clearing for the Project:

- could potentially lead to a long-term decrease in the size of an important population of the species, resulting in a significant impact
- could potentially reduce the area of occupancy of an important population
- could potentially disrupt the breeding cycle of an important population of the species, resulting in a significant impact.

6.4.3 Squatter Pigeon (Southern Subspecies)

Table E.3, Appendix E addresses impacts of the Project on the Vulnerable Squatter Pigeon (Southern Subspecies). It finds that activities associated with the Project would not result in any significant impact for the species when assessed against the significant impact criteria.

6.4.4 Koala

Table E.4, Appendix E provides the results of the assessment of impacts of the Project on the Vulnerable Koala. It finds that activities associated with the Project would not result in any significant impact for the species when assessed against the significant impact criteria.

6.4.5 Yakka Skink

Table E.5, Appendix E provides the results of the assessment of impacts of the Project on the Vulnerable Yakka Skink.

Given that the species is patchily distributed in the landscape, it must be considered that there is potential for the population in the study area to be an important population. The assessment finds that clearing for the Project:

- could potentially lead to a long-term decrease in the size of an important population of the species, resulting in a significant impact.
- could potentially disrupt the breeding cycle of an important population of the species, resulting in a significant impact.

6.4.6 Migratory Species

Table E.6, Appendix E addresses impacts on EPBC Act listed Migratory species. It finds that

activities associated with the Project would not result in any significant impact for Migratory species when assessed against the significant impact criteria.

6.5 ENVIRONMENTAL OFFSET REQUIREMENT

Where significant impacts on matters of national environmental significance cannot be avoided, mitigated or managed, the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) allows compensation for those impacts through the provision of appropriate environmental offsets.

Along the entire dragline transport route the proposed impact areas that have been assessed as representing 'significant impact' in accordance with the EPBC Act Significant Impact Guidelines 1.1 are:

- 9.7 ha of Brigalow TEC.
- 80.05 ha of "core" and "essential" habitat for Ornamental Snake.
- 99.35 ha of "core" and "essential" habitat for Yakka Skink.

BMC advises that native vegetation located on the South Walker Creek mining leases, inclusive of the identified Brigalow TEC area, is not required to be offset given that BMC has pre-EPBC Act authorisations to clear vegetation within the South Walker Creek mining leases 4750 and 70131. The pre-EPBC Act authorisations date from the grants of the "surface areas" within the mining leases in accordance with the Queensland *Mineral Resources Act 1989*. In this case, the grants occurred in September and October 1996, prior to the commencement of the EPBC Act on 16 July 2000. The South Walker Creek mining leases 4750 and 70131 are also noted on the Environmental Authority EPML00712313 issued under the Queensland *Environmental Protection Act 1994*. As a result, state offsets are not required for any native vegetation cleared on these leases. The pre-EPBC Act authorisation only relates to the 8.5 km section at the eastern end of the route.

Outside of the pre-EPBC Act authorisation areas, the proposed impact areas that have been assessed as representing significant impacts in accordance with the Significant Impact Guidelines 1.1 are:

- 21.6 ha of "core" and "essential" habitat for Ornamental Snake would be cleared for the dragline transport route.
- 60.3 ha of "core" and "essential" habitat for Yakka Skink would be cleared for the dragline transport route.

Note that there is considerable overlap of the habitat requirements for the two reptile species in this portion of the route.

The preparation of an Offset Strategy is required to identify appropriate offset measures for these species.

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APPENDIX A

Assessment of Likelihood of Occurrence of MNES values

Table A1. Likelihood of occurrence of terrestrial flora species of special conservation significance within the Study Area

Family	Scientific Name	Common Name	NC Act[1]	EPBC Act[1]	Habitat and Distribution	Likelihood Of Occurrence
Mimosaceae	*Acacia spania*	Western Rosewood	NT	-	Found in open woodland, typically on red earths, with a relatively restricted distribution in central Queensland (World Wide Wattle 2016).	**Unlikely to occur**. The nearest record is located at Iffley, >35 km south-east of the study area. That occurrence is associated with red dermosol, a soil type that is not mapped within the study area (www.asris.csiro.au).
Euphorbiaceae	*Bertya opponens*	-	C	V	Patchy in inland southern Queensland and northern New South Wales, mainly south of Emerald, but with an isolated population at White Mountains (ALA 2016). Found in a variety of woodland types, mainly on skeletal soils and/or associated with sandstone or laterite (Halford and Henderson 2002).	**Unlikely to occur**. There is a single record north-west of the study area (50km N. of Moranbah). It could possibly be encountered in the broader landscape in association with land zone 7; however the study area avoids areas of suitable habitat.
Euphorbiaceae	*Bertya pedicellata*	-	NT	-	This species occurs through much of central Queensland and is more restricted in south-east Queensland (ALA 2016). It occurs mainly on rocky slopes and on skeletal soils (Halford and Henderson 2002).	This species is known to occur adjacent to the study area; however it is considered **unlikely to occur** within the study area itself. There are two records just north of the study area at Coppabella and another record to the south of the alignment in the centre of the study area. The species was encountered near existing records adjacent to the centre of the study area where skeletal soils are present in land zone 7.
Capparaceae	*Capparis humistrata*	-	E	-	Restricted to the Marlborough–Bouldercombe and near Dingo in central Queensland. It tolerates ultramafic serpentine soils and sandy substrates in the Brigalow Belt (Hewson 1982).	**Unlikely to occur**. There is a single record, south-east of the study area. Grazing lands on sandy alluvium in the east of the study area are unlikely to provide suitable habitat for this species.
Apocynaceae	*Cerbera dumicola*	-	NT	-	Mainly restricted to central Queensland where it occurs in a variety of habitats, mainly in sloping terrain (ALA 2016).	**Known to occur**. There are three records adjacent to the western part of the study area and the species was found on the fringes of the study area during the field survey.
Cycadaceae	*Cycas ophiolitica*	Marlborough Blue	E	E	Restricted to central Queensland where it occurs in shallow soils in sloping terrain (Queensland Herbarium 2007).	**Unlikely to occur**. There are no records within 80 km of the study area.
Poaceae	*Dichanthium queenslandicum*	King Blue-grass	V	E	Found in inland central and southern Queensland and is mostly restricted to native grassland on cracking clay soils (Fensham 1999).	**Potential to occur**. There are records north of the study area, east of Goonyella Mine, and east of the study area, north of Strathfield. It could occur in grassland on land zone 4; however grasslands in the study area were found to be dominated by pasture grasses and it was not encountered during the field surveys.
Poaceae	*Dichanthium setosum*	Blue-grass	C	V	This species has a disjunct distribution with a population in central Queensland and another in the northern tablelands of New South Wales and south-east Queensland. It occurs in woodland communities on cracking clay soils (ALA 2016).	**Potential to occur**. There are records north of the western portion of the study area, east of Goonyella Mine, and north of the central portion of the study area, in the vicinity of Coppabella. It could occur in woodland communities on land zone 4 in the centre of the study area; however it was not encountered during the field surveys.
Poaceae	*Digitaria porrecta*	Finger Panic-grass	NT	-	Widespread on the northern tablelands of New South Wales and south-east Queensland, where it occurs on cracking clay soils and in alluvium in open woodland communities (ALA 2016).	**Unlikely to occur**. The nearest records are near Braeside and near Lancewood, to the east and north of the study area, respectively. No records have been obtained within 20 km of the study area and the species is sporadic in the region. The species was not encountered during the field survey, despite ample search effort in areas of suitable habitat.
Myrtaceae	*Eucalyptus raveretiana*	Black Ironbox	C	V	Found along drainage channels and in alluvial soils in central Queensland (ALA 2016).	**Potential to occur**. There are records immediately to the east of the alignment and the species could be present along drainage channels within the eastern portion of the study area; however the species was not encountered during the field survey.
Amaranthaceae	*Kelita uncinella*	-	E	-	Highly restricted to a population north-west of Glenden and a single occurrence east of Goonyella Mine. It occurs in low shrubby woodland on slopes of land zone 7 (Bean 2010).	**Potential to occur**. A record to the east of Goonyella Mine is positioned approximately 5 km to the north of the study area. This species could be found in association with land zone 7; however it was not encountered during the field survey and the study area avoids most vegetated areas on land zone 7.
Combretaceae	*Macropteranthes leiocaulis*	Southern Bonewood	NT	-	Found in subcoastal Queensland from south of Townsville to Mundubbera (ALA 2016). It occurs in vine thickets (Forster 1994).	**Unlikely to occur**. The nearest records are in Dipperu National Park, approximately 20 km to the east of the study area and there is only a very marginal occurrence of vine thicket habitat present within the study area.
Euphorbiaceae	*Omphalea celata*	-	V	V	Restricted to coastal and subcoastal central Queensland where it occurs in vine thicket growing as an understorey to riverine woodland in steep gullies and gorges (ALA 2016).	**Unlikely to occur**. Habitats within the study area are not expected to be suitable for this species and the nearest record is from Homevale National Park, approximately 37 km to the northeast of the study area.
Simaroubaceae	*Samadera bidwillii*	Quassia	V	V	Rainforest and open forest in coastal and subcoastal central and south-eastern Queensland south to the Sunshine Coast (ALA 2016).	**Unlikely to occur**. There are no confirmed records within 100 km of the study area.
Solanaceae	*Solanum adenophorum*	Hairy Nightshade	E	-	Found in central Queensland from near Moranbah south to near Duaringa where it occurs in association with brigalow-dominated woodland communities (ALA 2016).	**Potential to occur**. This species has been recorded near Goonyella and in Dipperu National Park. It could potentially occur in the study area in brigalow communities with leaf litter; however it was not encountered during the field surveys.

[1] Status abbreviations are as follows: CE = Critically Endangered, E = *Endangered*, V = *Vulnerable*, NT = *Near Threatened, C = Least Concern, - = Not Listed.*

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Table A2. Likelihood of occurrence of fauna species of special conservation significance within the Study Area

Family	Species Name	Common Name	Source[1]			Conservation Status[2]		Likelihood of Occurrence
			ALA	WN	EPBC	EPBC Act	NC Act	
CHELIDAE	*Elseya albagula*	Southern Snapping Turtle	-	-	X	CE	C	Known from the Burnett, Fitzroy, Raglan and Mary River Basins. The study area is positioned in the upper Fitzroy Basin (Isaac River catchment); however the nearest record is located approximately 68 km away, in the adjacent Connors River catchment (ALA 2016, WN 2016). This species prefers clear, flowing well-oxygenated waters; may occur in non-flowing waters at reduced densities, but requires permanent pools, preferably with shelter such as rock crevices, undercut banks, submerged logs or fallen trees (DOE 2014, Hamann et al. 2007). Waterways in study area are characterised by sandy channels that are mostly dry in the dry season. While some small pools were noted during field surveys, they are unlikely to be sufficient to support this species. There are no known records from the Isaac River catchment (ALA 2016, WN 2016, Limpus et al. 2011). **Unlikely to occur** due to a lack of suitable habitat .
CHELIDAE	*Rheodytes leukops*	Fitzroy River Turtle	-	-	X	V	V	Restricted to the Fitzroy River Basin; however the nearest record is located approximately 68 km away, in the Connors River catchment (ALA 2016). Considered to be a riffle zone specialist, but retreats to large, deep pools during dry season if necessary (DOEE 2016). Often associated with rocky substrates and ribbonweed beds (DOEE 2016). Waterways in study area are characterised by sandy channels that are mostly dry in the dry season and would be characterised by runs during the wet season (i.e. few, if any, riffles present). There are no known records from the Isaac River catchment (ALA 2016, Limpus et al. 2011). **Unlikely to occur** due to a lack of suitable habitat.
SCINCIDAE	*Egernia rugosa*	Yakka Skink	-	-	X	V	V	Drier forests and woodlands mainly associated with the Brigalow Belt but also known from northern and south-east Queensland. There are no records of this species within 150 km of the study area; however the species has widely scattered distribution across a wide variety of habitats, is easily overlooked and under-recorded. The study area was identified as supporting several areas of potentially suitable habitat for Yakka Skink. Notably, the field survey was conducted in late winter, which not considered to be suitable time for detecting this species. **Potential to occur**.
SCINCIDAE	*Lerista allanae*	Allan's Lerista	-	-	X	E	E	Restricted to the broader Clermont and Capella regions in central Queensland where it occurs in highly localised populations on friable soils (Wilson 2005). The nearest record is located approximately 70 km to the south-west of the study area. The study area falls outside of the known range of the species. Previous records have been associated with mixed *Eucalyptus orgadophila* and *Corymbia erythrophloia* or Bauhinia-dominated woodlands; however these habitats are not present in the study area. **Unlikely to occur**.
ELAPIDAE	*Acanthophis antarcticus*	Common Death Adder	-	X	-	-	V	Poorly known. This is a highly cryptic, under-detected species. It occurs in a wide variety of habitats from rainforest to shrublands and heathlands (Wilson and Swan 2008). **Potential to occur**.
ELAPIDAE	*Demansia maculata*	Ornamental Snake	X	X	X	V	V	This species occurs in the Brigalow Belt between Charters Towers and Rockhampton where it is associated with seasonally inundated areas (Wilson 2005; Wilson and Swan 2008). There are several records to the west and south of the alignment and the study area contains mapped Essential Habitat for this species. The presence of suitable habitat was confirmed during the field survey. **Likely to occur**.
ELAPIDAE	*Furina dunmalli*	Dunmall's Snake	-	-	X	V	V	This species occurs in the Brigalow Belt in dry sclerophyll forests, cypress, and other woodlands on floodplains, or near watercourses in coastal areas (Wilson 2005; Wilson and Swan 2008). The nearest record is 120 km south-west of the study area and the alignment is positioned outside of the known distribution of the species. **Unlikely to occur.**
APODIDAE	*Hirundapus caudacutus*	White-throated Needletail	X	X	-	M	S	This is an aerial species, typically occurring over open, inland habitats, but occasionally over coastal areas (Higgins 1999; Pizzey and Knight 2003). **Likely to occur** during some seasons, although with limited interaction in the study area, apart from the consumption of airborne invertebrates.
APODIDAE	*Apus pacificus*	Fork-tailed Swift	X	-	X	M	S	This is an aerial species, typically occurring over open, inland habitats, but occasionally over coastal areas (Higgins 1999; Pizzey and Knight 2003). **Likely to occur**, although with limited interaction in the study area, apart from the consumption of airborne invertebrates.
ARDEIDAE	*Ardea modesta*	Eastern Great Egret	X	X	X	M	S	Shallow inland wetland habitats, including man-made dams and ponds and moist grasslands. (Marchant and Higgins 1990; Pizzey and Knight 2003). **Likely to occur** in wetlands within the study area.
PANDIONIDAE	*Pandion cristatus*[3]	Eastern Osprey	-	-	X	M	S	A raptor species associated with the coastal belt (Pizzey and Knight 2003). **Unlikely to occur** in the study area.
ACCIPITRIDAE	*Erythrotriorchis radiatus*	Red Goshawk	-	X	X	V	E	Woodlands and forests, ideally with a mosaic of vegetation types and permanent water, particularly riverine forests. The species avoids both very dense and very open habitats (Marchant and Higgins 1993). Home range covers between 50 and 220 square kilometres. There are historical records from the study area. The species has declined over much of its range and there are limited resources available support a population in the vicinity of the study area. **Unlikely to occur**.
THRESKIONIDAE	*Plegadis falcinellus*	Glossy Ibis		X	-	M	S	This species occurs in shallow, vegetated wetlands and flooded grasslands across northern Australia (Marchant and Higgins 1990). There are two records in the broader landscape; however areas of suitable habitat are not present in the study area. **Unlikely to occur**.
ROSTRATULIDAE	*Rostratula australis*[4]	Australian Painted Snipe	X	-	X	E,M	V	Terrestrial shallow wetlands, both ephemeral and permanent, usually freshwater but occasionally brackish. They also use inundated grasslands, saltmarsh, dams, rice crops, sewage farms and bore drains (Marchant and Higgins 1993). Potential to occur in ephemeral wetlands adjacent to the study area. **Unlikely to occur** in the study area itself.
SCOLOPACIDAE	*Callidris accuminata*	Sharp-tailed Sandpiper		X	-	M	S	Shallow wetland areas, including margins of lakes, throughout Australia (Pizzey and Knight 2003). Potential to occur in ephemeral wetlands adjacent to the study area. **Unlikely to occur** in the study area itself.
SCOLOPACIDAE	*Tringa nebularia*	Common Greenshank	-	X	X	M	S	Shallow wetland areas, including margins of lakes, throughout Australia (Pizzey and Knight 2003). Potential to occur in ephemeral wetlands adjacent to the study area. **Unlikely to occur** in the study area itself.
SCOLOPACIDAE	*Tringa stagnatalis*	Marsh Sandpiper	-	X	-	M	S	Shallow wetland areas, including margins of lakes, throughout Australia (Pizzey and Knight 2003). Potential to occur in ephemeral wetlands adjacent to the study area. **Unlikely to occur** in the study area itself.
SCOLOPACIDAE	*Gallinago hardwickii*	Latham's Snipe	-	-	X	M	S	Swamp and marsh margins and in wet pasture (Pringle 1987). There are no records in the broader landscape. **Unlikely to occur** in the study area due to lack of suitable habitat.
LARIDAE	*Hydroprogne caspia*	Caspian Tern	X	X	-	M	S	Over larger waterbodies, including lakes, rivers and coastal fringes (Higgins and Davies 1996). There are records in the broader landscape; however the study area contains limited suitable habitat. **Unlikely to occur.**
LARIDAE	*Gelochelidon nilotica*	Gull-billed Tern	X	X	-	M	S	Over larger waterbodies, including lakes, rivers and coastal fringes (Higgins and Davies 1996). There are records in the broader landscape; however the study area contains limited suitable habitat. **Unlikely to occur.**

Family	Species Name	Common Name	Source[1]			Conservation Status[2]		Likelihood of Occurrence
			ALA	WN	EPBC	EPBC Act	NC Act	
COLUMBIDAE	*Geophaps scripta scripta*	Squatter Pigeon (southern subsp.)	X	X	X	V	V	Open dry sclerophyll woodland with grassy understorey, nearly always near permanent water. Birds may occasionally feed in sown grasslands and pastures (Crome and Shields 1992; Higgins and Davies 1996). There are numerous records in the vicinity of the study area and several records were obtained during the field survey. **Known to occur**.
CACATUIDAE	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	X	X	-	-	V	Feeds in localised occurrences of fruiting *Allocasuarina* (Pizzey and Knight 2003). The species is known to occur in Dipperu National Park south-east of the study area and there are food trees present in the eastern half of the study area. However, no signs of feeding activity were detected during the field survey and the study area itself contains limited resources for this species. **Unlikely to occur.**
CUCULIDAE	*Cuculus optatus*	Oriental Cuckoo	X	-	-	M	S	Migrant species that can occur in a variety of habitats including rainforest, open eucalypt forest, leafy trees in paddocks and mangroves (Higgins 1999). There are two records in the broader landscape. **Potential to occur** in the study area as a sporadic visitor.
MONARCHIDAE	*Myiagra cyanoleuca*	Satin Flycatcher	-	-	X	M	S	This species inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands. It could move through the region as a passage migrant, but is unlikely to stay in the local landscape and there are no records in the area. **Unlikely to occur**.
MONARCHIDAE	*Monarcha melanopsis*	Black-faced Monarch	X	X	X	M	S	This species inhabits vegetated gullies in eucalypt-dominated forests and taller woodlands (Higgins et al. 2006). There are three records in the landscape; however the study area is considered unlikely to contain suitable habitat. **Unlikely to occur**.
MONARCHIDAE	*Symposiarchus trivirgatus*	Spectacled Monarch	X	X	-	M	S	This species inhabits vegetated gullies, rainforest and riparian forest (Higgins et al. 2006). There is a single record in the landscape; however the study area is considered unlikely to contain suitable habitat. **Unlikely to occur**.
RHIPIDURIDAE	*Rhipidura ruficauda*	Rufous Fantail	X	X	-	M	S	This species inhabits vegetated gullies, rainforest and riparian forest (Higgins et al. 2006). There are three records in the landscape; however the study area is considered unlikely to contain suitable habitat. **Unlikely to occur**.
MOTACILLIDAE	*Motacilla flava*	Yellow Wagtail	-	-	X	M	S	Yellow Wagtail is a regular migrant to Australia in low numbers, occurring in open landscapes, swamp margins and paddocks (Higgins et al. 2006). There are no records in the vicinity of the study area. **Unlikely to occur**, except as a potential vagrant.
ACROCEPHALIDAE	*Acrocephalus australis*	Australian Reed-warbler	X	X	-	M	S	Australian Reed-Warbler is found throughout Australia where there is suitable habitat. The species prefers dense vegetation alongside water, especially thick reed beds, as well as tall crops, bamboo thickets and lantana. There are records in the broader landscape; however it is **unlikely to occur** in the study area due to a lack of suitable habitat.
ESTRILDIDAE	*Neochmia ruficauda ruficauda*	Star Finch (eastern subspecies)	-	-	-	E	E	**Unlikely to occur.** This species occurs in grassy areas in the vicinity of water. Over the last 100 years, the species has disappeared from its former range, and is most likely extinct in southern and central Queensland. In addition, there are no records in the broader landscape surrounding the study area.
TACHYGLOSSIDAE	*Tachyglossus aculeatus*	Short-beaked Echidna	X	X	-	-	S	This is a widespread and fairly common (although secretive) species with several records in the broader landscape (ALA 2016). **Likely to occur.**
DASYURIDAE	*Dasyurus hallucatus*	Northern Quoll	-	X	X	E	C	Northern Quoll lives in a range of habitats but prefer rocky areas and eucalypt forests. The species was once found from north of Brisbane right across to the northern parts of the Western Australian coast. It is now reduced to populations in the Northern Territory, Western Australia and several areas of Queensland. There nearest database records are from Homevale National Par, approximately 37 km northeast of the study area. **Unlikely to occur** in the study area, due to the absence of suitable habitat.
PSEUDOCHEIDAE	*Petauroides volans*	Greater Glider		X	X	V	C	This species is associated with mature eucalypt forest and woodland with hollow trees available for shelter (Menkhorst and Knight 2004). There is a record approximately 10 km south of the study area; however it is considered unlikely that the study area itself would contain suitable habitat for the species. **Unlikely to occur**.
PHASCOLARCTIDAE	*Phascolarctos cinereus*	Koala	-	X	-	V	V	Sclerophyll forest and woodland on foothills and plains on both sides of the Great Dividing Range (Menkhorst and Knight 2004). Scattered database records exist in the broader landscape, including a recent record 1 km to the east of the study area along South Walker Creek Road. No evidence of Koala activity was detected during the field survey. It is, nevertheless, **likely to occur** at a low density in the vicinity of the study area**.**
MEGADERMATIDAE	*Macroderma gigas*	Ghost Bat	-	X	X	V	V	This species occurs in a range of habitats through much of the tropics, roosting in caves or abandoned mine shafts during the day (Churchill 2008). There is a single historical record from 28 km to the north-east of the study area; however habitats within the study area are no longer expected to support this species. **Unlikely to occur.**
VESPERTILIONIDAE	*Nyctophilus corbeni*	South-eastern Long-eared Bat	-	-	X	V	V	This species occurs in open woodland and has also been recorded in dry rainforest at some localities (Parnaby 2009). It roosts under the shelter of bark. The nearest record is from Expedition Range National Park, >250 km south of the study area. **Unlikely to occur.**

[1] Source abbreviations are as follows: ALA = Atlas of Living Australia Portal, WN = WildNet database records, EPBC = EPBC online search results. 0

[2] Status abbreviations are as follows: Ex = *Extinct*; CE = *Critically Endangered*, E = *Endangered*, V = *Vulnerable*, NT = *Near Threatened*, M = *Migratory*, S = Special *Least Concern*, C = *Least Concern* Wildlife.

[3] Listed as *Migratory* under the EPBC Act as Osprey *Pandion haliaetus*

[4] Listed as *Migratory* under the EPBC Act as Painted Snipe *Rostratula benghalensis s. lat*.

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APPENDIX B

Vegetation Assessment Results for Communities Assessed as Brigalow TEC

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
B3 -21.83371422 148.48421498 -21.83393315 148.48424717 -21.83435292 148.48435295 -21.83454780 148.48437491	**Mapped RE:** 11.4.9/11.5.3 **Ground-truthed RE:** 11.4.9 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow open forest. **Canopy (T1):** 69.9% cover. Height range 10-16m; median height 14m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** 1.1% cover. Height range 6-10m; median height 8m. Dominant species: *Acacia harpophylla.* **Shrub (S1):** 5.7% cover. Height range 2-6m; median height 4m. Dominant species: *Terminalia oblongata, Lysiphyllum cunninghamii.* **Shrub (S2): 2.9**% cover. Height range 0-2m; median height 1m. Dominant species: *Carissa ovata, Acacia harpophylla.* **Groundcover: 16.8**% cover. Dominant species: *Brunoniella acaulis, Cyperus* sp. Associated species*: Cheilanthes* sp. **Notes:** Ground-truthed as Endangered RE. Ground-truthed as Brigalow TEC. This brigalow patch is also on the other side of the track, but is narrower on the western side of the track.	
B7 -21.91612484 148.41905968 -21.91621444 148.41884460 -21.91638703 148.41839173 -21.91647478 148.41817615	**Mapped RE:** 11.9.4/11.9.5 **Ground-truthed RE:** 11.9.5 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow open forest. **Canopy (T1):** 23.3% cover. Height range 9-15m; median height 10m. Dominant species: *Acacia harpophylla, Eucalyptus populnea.* **Sub-canopy (T2):** Height range 5-8m; median height 6m. Dominant species: *Acacia harpophylla, Eucalyptus populnea.* **Shrub (S1):** 2.9% cover. Height range 1.5-5m; median height 3m. Dominant species: *Acacia harpophylla, Ehretia membranifolia.* Associated species*: Lysiphyllum cunninghamii* **Shrub (S2): 2.6**% cover. Height range 0-1.5m; median height 1m. Dominant species: *Carissa ovata, Alectryon diversifolius.* **Groundcover:** n/a **Notes:** Ground-truthed as Endangered RE. Ground-truthed as Brigalow TEC.	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
B8 -21.90574125 148.43614468 -21.90595759 148.43606095 -21.90639186 148.43592541 -21.90660199 148.43584729	**Mapped RE:** 11.9.3/11.9.7 **Ground-truthed RE:** 11.9.1 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow-Eucalypt open forest. **Canopy (T1):** 3.2% cover. Height range 20-28m; median height 24m. Dominant species: *Eucalyptus cambageana.* **Sub-canopy (T2):** 46.9% cover. Height range 9-16m; median height 12m. Dominant species: *Acacia harpophylla, Eucalyptus cambageana.* **Shrub (S1):** 1.1% cover. Height range 1.5-5m; median height 3m. Dominant species: *Terminalia oblongata, Casuarina cristata.* Associated species*: Acacia harpophylla* **Shrub (S2): 52.2**% cover. Height range 0-1.5m; median height 1m. Dominant species: *Carissa ovata, Alectryon diversifolius.* Associated species*: Casuarina cristata* **Groundcover:** n/a **Notes:** RE mapping discrepancies (ground-truthed as Endangered RE). Ground-truthed as Brigalow TEC.	
B14 -21.88841050 148.25783654 -21.88834311 148.25760252 -21.88831947 148.25718191 -21.88826574 148.25690540	**Mapped RE:** Non-Remnant; adjacent to 11.3.37 **Ground-truthed RE:** 11.9.5 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow forest. **Canopy (T1):** 54.5% cover. Height range 12-18m; median height 15m. Dominant species: *Acacia harpophylla, Eucalyptus populnea.* **Sub-canopy (T2):** n/a. **Shrub (S1):** n/a **Shrub (S2):** n/a. **Groundcover:** n/a **Notes:** RE mapping discrepancies (ground-truthed as remnant, Endangered RE). Ground-truthed as Brigalow TEC.	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q6 -21.82063392 148.46873989	**Mapped RE:** Non-Remnant; adjacent 11.5.3/11.4.9 **Ground-truthed RE:** Non-Remnant; adjacent is 11.5.3/11.4.9 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Endangered	**Brief description:** Eucalypt woodland. **Canopy (T1):** 30% cover. Height range 15-20m; median height 17m. Dominant species: *Eucalyptus populnea*, *Casuarina cristata.* **Sub-canopy (T2):** Height range 6-12m; median height 9m. Dominant species: *Terminalia oblongata.* **Shrub:** Height range 1.5-6m; median height 4m. Dominant species: *Erythroxylum australe.* **Groundcover:** n/a. **Notes:** The 11.4.9 component of this vegetation is the western edge of a large patch of vegetation containing 11.4.9, with brigalow dominant or sub-dominant in some areas. Examination of aerial imagery following the field survey indicates that this area corresponds to the Brigalow TEC.	
Q19 -21.82560355 148.46990372	**Mapped RE:** Non-Remnant; adjacent 11.4.9/11.5.3 **Ground-truthed RE:** 11.4.9 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Belah woodland. **Canopy (T1):** 30% cover. Height range 12-18m; median height 16m. Dominant species: *Casuarina cristata, Terminalia oblongata.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** RE mapping discrepancies (ground-truthed as remnant). Brigalow confirmed to be dominant elsewhere within patch. Ground-truthed as Endangered RE. Ground-truthed as Brigalow TEC.	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q22 -21.83742698 148.48392388	**Mapped RE:** 11.5.3/11.4.9 **Ground-truthed RE:** 11.4.9 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow open forest. **Canopy (T1):** 60% cover. Height range 10-15m; median height 13m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** South-western edge of Brigalow patch (see site **B3**). Endangered RE confirmed. Brigalow TEC confirmed.	
Q23 -21.83819326 148.48488528	**Mapped RE:** 11.5.3/11.4.9 **Ground-truthed RE:** 11.4.9 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow open forest. **Canopy (T1):** 60% cover. Height range 10-14m; median height 12m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** South-western edge of Brigalow patch (see site **B3**). Endangered RE confirmed. Brigalow TEC confirmed.	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q29 -21.91643069 148.41888609	**Mapped RE:** 11.9.4/11.9.5 **Ground-truthed RE:** 11.9.5 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow open forest. **Canopy (T1):** 69.9% cover. Height range 10-12m; median height 11m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** Endangered RE confirmed. Brigalow TEC confirmed. Also refer site **B7** for a more detailed assessment of this patch.	
Q33 -21.91326569 148.42681705	**Mapped RE:** 11.9.4/11.9.5 **Ground-truthed RE:** 11.9.1 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Engangered	**Brief description:** Brigalow-Eucalypt open forest. **Canopy (T1):** 20% cover. Height range 18-25m; median height 22m. Dominant species: *Eucalyptus cambageana.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** RE mapping discrepancies (ground-truthed as Endangered RE). Ground-truthed as Brigalow TEC. This is a vegetation boundary - here to north-west is 11.9.1; to south-west is 11.9.7.	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q34 -21.90395113 148.43659521	**Mapped RE:** 11.9.3/11.9.7 **Ground-truthed RE:** 11.9.1 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow-Eucalypt open forest. **Canopy (T1):** 15% cover. Height range 10-18m; median height 14m. Dominant species: *Eucalyptus cambageana, Casuarina cristata.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** RE mapping discrepancies (ground-truthed as Endangered RE). Ground-truthed as Brigalow TEC.	
Q35 -21.90942896 148.43268882	**Mapped RE:** 11.9.3/11.9.7 **Ground-truthed RE:** 11.9.1 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow-Eucalypt open forest. **Canopy (T1):** 10% cover. Height range 20-28m; median height 24m. Dominant species: *Eucalyptus cambageana.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** RE mapping discrepancies (ground-truthed as Endangered RE). Ground-truthed as Brigalow TEC (also refer to site **B8** for a more detailed assessment within this patch).	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q47 -21.94481090 148.35693972	**Mapped RE:** 11.5.3/11.7.2 **Ground-truthed RE:** 11.4.9 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow-Belah forest. **Canopy (T1):** 70% cover. Height range 15-24m; median height 19m. Dominant species: *Casuarina cristata.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** RE mapping discrepancies (ground-truthed as Endangered RE). Ground-truthed as Brigalow TEC. Gully.	
Q59 -21.8879 148.25621	**Mapped RE:** 11.9.5/11.9.3 **Ground-truthed RE:** 11.9.5 with 11.9.7/11.5.3 adjacent **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**Brief description:** Brigalow forest. **Canopy (T1):** Height range 9-12m; median height 12m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** Height range 4-6m; median height 5m. Dominant species: *Eremophila mitchellii, Petalostigma pubescens, Erythroxylum australe.* **Shrub:** Height range 0.4-1m; median height 0.6m. Dominant species: *Carissa ovata.* **Groundcover:** Dominant species: *Aristida sp., Chloris virgata, Einadia nutans, Harrisia martinii.* **Notes:** Confirmed as Endangered RE. Confirmed as Brigalow TEC.	

APPENDIX C

Vegetation Assessment Results for Communities Assessed as Not TECs

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
B1 -21.80332412 148.46553097 -21.80356435 148.46557916 -21.80420305 148.46571721 -21.80401848 148.46575887	**Mapped RE:** 11.5.3/11.4.9 **Ground-truthed RE:** 11.4.9 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Not listed	**Brief description:** Belah woodland. **Canopy (T1):** 28% cover. Height range 14-18m; median height 16m. Dominant species: *Casuarina cristata, Eucalyptus populnea.* **Sub-canopy (T2):** n/a. **Shrub (S1):** 7.8% cover. Height range 2-6m; median height 4m. Dominant species: *Psydrax odorata, Terminalia oblongata.* Associated species*: Flindersia dissosperma* **Shrub (S2):** 18.1% cover. Height range 0-2m; median height 1m. Dominant species: *Carissa ovata, Diospyros humilis.* **Groundcover:** 13.2% cover. Dominant species: *Cenchrus ciliaris, Bothriochloa pertusa.* Associated species*: Brunoniella acaulis* **Notes:** Ground-truthed as Endangered RE. Brigalow not present in this patch	
B2 -21.82690619 148.47499799 -21.82691230 148.47524056 -21.82686872 148.47566754 -21.82685656 148.47596702	**Mapped RE:** 11.4.9/11.5.3 **Ground-truthed RE:** 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 33.8% cover. Height range 12-18m; median height 15m. Dominant species: *Eucalyptus populnea, Casuarina cristata.* **Sub-canopy (T2):** Height range 6-10m; median height 8m. Dominant species: *Eucalyptus populnea.* **Shrub (S1):** 30.7% cover. Height range 2-6m; median height 4m. Dominant species: *Erythroxylum australe, Flindersia dissosperma.* Associated species: *Eremophila mitchellii.* **Shrub (S2): 9.8**% cover. Height range 0-2m; median height 1m. Dominant species: *Flindersia dissosperma, Petalostigma pubescens.* **Groundcover: 5.2**% cover. Dominant species: *Digitaria sp., Bothriochloa pertusa.* Associated species: *Brunoniella acaulis.* **Notes:** Ground-truthed as Least Concern RE. Ground-truthed as not TEC.	

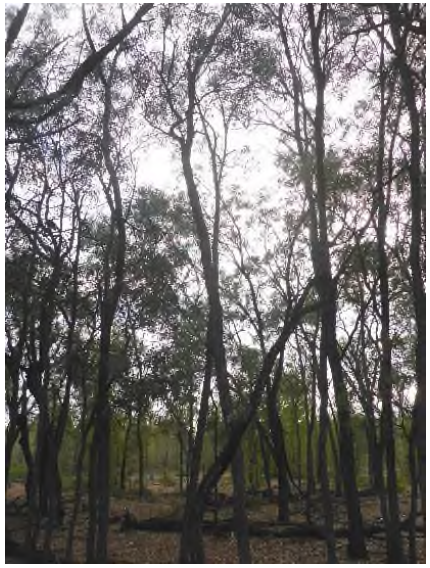
Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
B11 -21.93116248 148.39172881 -21.93067934 148.39246080 -21.93105410 148.39190491 -21.93078596 148.39227330	**Mapped RE:** 11.5.15 **Ground-truthed RE:** 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 20.6% cover. Height range 15-25m; median height 22m. Dominant species: *Eucalyptus populnea, Acacia rhodoxylon.* **Sub-canopy (T2):** 3.5% cover. Median height 11m. Dominant species: *Acacia rhodoxylon, Eucalyptus populnea.* Associated species*: Notelaea linearis* **Shrub (S1):** 19.9% cover. Median height 6m. Dominant species: *Acacia rhodoxylon, Croton insularis.* Associated species*: Diospyros geminata* **Shrub (S2):** 41.1% cover. Median height 1m. Dominant species: *Acalypha eremorum, Carissa ovata.* **Groundcover:** n/a **Notes:** RE mapping discrepancies (ground-truthed as not SEVT). Ground-truthed as not SEVT TEC.	
Q1 -21.82737356 148.48357762	Mapped RE: Non-Remnant; adjacent 11.5.3/11.4.9 Ground-truthed RE: Non-Remnant; adjacent is 11.5.3 VM Act Status: Least Concern Biodiversity Status: No Concern at Present EPBC Act Status: Not listed	Brief description: Eucalypt woodland. Canopy (T1): 30% cover. Height range 15-20m; median height 17m. Dominant species: *Eucalyptus populnea.* Sub-canopy (T2): n/a. Shrub: 30% cover. Height range 1.5-4m; median height 3m. Dominant species: *Terminalia oblongata.* Groundcover: Dominant species: *Bothriochloa pertusa* Notes: Adjacent vegetation ground-truthed as not Brigalow TEC.	None available

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q2 -21.82739980 148.47792202	**Mapped RE:** Non-Remnant; adjacent 11.5.3/11.4.9 **Ground-truthed RE:** Non-Remnant; adjacent is 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 30% cover. Height range 15-20m; median height 17m. Dominant species: *Eucalyptus populnea.* **Sub-canopy (T2):** n/a. **Shrub:** n/a **Groundcover:** n/a. **Notes:** Adjacent vegetation ground-truthed as not Brigalow TEC. Brigalow 100m to north.	None available
Q3 -21.82738513 148.47247529	**Mapped RE:** Non-Remnant; adjacent 11.5.3/11.4.9 **Ground-truthed RE:** Non-Remnant; adjacent is 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 30% cover. Height range 15-20m; median height 17m. Dominant species: *Eucalyptus populnea.* **Sub-canopy (T2):** n/a. **Shrub:** Height range 2-6m; median height 4m. Dominant species: *Terminalia oblongata.* **Groundcover:** n/a. **Notes:** Vegetation ground-truthed as not Brigalow TEC. However, brigalow TEC is present adjacent to this site.	None available

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q4 -21.82357941 148.46900392	**Mapped RE:** Non-Remnant; adjacent 11.5.3/11.4.9 **Ground-truthed RE:** Non-Remnant; adjacent is 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 25% cover. Height range 15-20m; median height 17m. Dominant species: *Eucalyptus populnea, Casuarina cristata.* **Sub-canopy (T2):** n/a. **Shrub:** n/a **Groundcover:** n/a. **Notes:** Vegetation ground-truthed as not Brigalow TEC. However, brigalow occurs in a mosaic as part of the community to the east; therefore, brigalow TEC is present adjacent to this site.	
Q5 -21.82148712 148.46857158	**Mapped RE:** Non-Remnant; adjacent 11.5.3/11.4.9 **Ground-truthed RE:** Non-Remnant; adjacent is 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 30% cover. Height range 12-20m; median height 15m. Dominant species: *Eucalyptus populnea, Casuarina cristata.* **Sub-canopy (T2):** n/a. **Shrub:** Height range 2-6m; median height 4m. Dominant species: *Alphitonia excelsa.* **Groundcover:** n/a. **Notes:** Washed out gully. Adjacent vegetation ground-truthed as not Brigalow TEC.	None available

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q7 -21.81944076 148.46874626	**Mapped RE:** 11.5.3/11.4.9 **Ground-truthed RE:** 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 25% cover. Height range 14-20m; median height 16m. Dominant species: *Eucalyptus populnea, Eucalyptus platyphylla.* Associated species*: Corymbia clarksoniana* **Sub-canopy (T2):** 5% cover. Height range 6-10m; median height 8m. Dominant species: *Alphitonia excelsa.* **Shrub:** 2% cover. Height range 2-5m; median height 3m. Dominant species: *Petalostigma pubescens.* **Groundcover:** n/a. **Notes:** Ground-truthed as not Brigalow TEC.	
Q8 -21.81813327 148.46863420	**Mapped RE:** 11.5.3/11.4.9 **Ground-truthed RE:** 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 25% cover. Height range 14-20m; median height 16m. Dominant species: *Eucalyptus populnea.* **Sub-canopy (T2):** n/a. **Shrub:** 5% cover. Height range 2-5m; median height 3m. Dominant species: *Alphitonia excelsa.* **Groundcover:** n/a. **Notes:** Ground-truthed as not Brigalow TEC.	
Q14 -21.80265793 148.46537674	**Mapped RE:** 11.5.3/11.4.9 **Ground-truthed RE:** 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 25% cover. Height range 15-20m; median height 17m. Dominant species: *Eucalyptus populnea.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** Ground-truthed as not Brigalow TEC.	None available

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q15 -21.80762127 148.46610957	**Mapped RE:** Non-Remnant; adjacent 11.5.3/11.3.4 **Ground-truthed RE:** 11.4.9 - but < 0.5 ha (only 75m X 10m) **VM Act Status:** n/a **Biodiversity Status:** n/a **EPBC Act Status:** Not listed	**Brief description:** Brigalow open forest. **Canopy (T1):** 40% cover. Height range 14-18m; median height 16m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** 2% cover. Height range 2-6m; median height 4m. Dominant species: *Terminalia oblongata.* **Groundcover:** Dominant species: *Ancistrachne uncinulata* **Notes:** Ground-truthed as Endangered RE, although patch not large enough to be mapped. Ground-truthed as not Brigalow TEC (<0.5 ha).	
Q16 -21.80827531 148.46633596	**Mapped RE:** Non-Remnant; adjacent 11.5.3/11.3.4 **Ground-truthed RE:** 11.4.9 - but < 0.5 ha (only 75m X 10m) **VM Act Status:** n/a **Biodiversity Status:** n/a **EPBC Act Status:** Not listed	**Brief description:** Brigalow open forest. **Canopy (T1):** 40% cover. Height range 14-18m; median height 16m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** Ground-truthed as Endangered RE, although patch not large enough to be mapped. Ground-truthed as not Brigalow TEC (<0.5 ha).	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q20 -21.82880050 148.48362532	**Mapped RE:** Non-Remnant; adjacent 11.5.3/11.4.9 **Ground-truthed RE:** Non-Remnant; adjacent is 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 35% cover. Height range 15-21m; median height 18m. Dominant species: *Eucalyptus populnea.* **Sub-canopy (T2):** n/a. **Shrub:** Height range 0-1.5m; median height 1m. Dominant species: *Carissa ovata.* **Groundcover:** n/a. **Notes:** Ground-truthed as not Brigalow TEC.	
Q21 -21.83203440 148.48413569	**Mapped RE:** Non-Remnant; adjacent 11.4.9/11.5.3 **Ground-truthed RE:** 11.4.9 but < 0.5 ha (40m X 50m) **VM Act Status:** n/a **Biodiversity Status:** n/a **EPBC Act Status:** Not listed	**Brief description:** Brigalow open forest. **Canopy (T1):** 60% cover. Height range 18-15m; median height 12m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** 2% cover. Height range 0-2m; median height 1m. Dominant species: *Carissa ovata.* **Groundcover:** n/a. **Notes:** Ground-truthed as Endangered RE, although patch not large enough to be mapped. Ground-truthed as not Brigalow TEC (<0.5 ha).	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q26 -21.84038722 148.48520505	**Mapped RE:** 11.5.3/11.3.4 **Ground-truthed RE:** 11.3.4 **VM Act Status:** Of Concern **Biodiversity Status:** Of Concern **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 25% cover. Height range 12-15m; median height 14m. Dominant species: *Eucalyptus tereticornis, Corymbia clarksoniana.* Associated species: *Corymbia dallachiana.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** Of Concern RE confirmed. There is no Brigalow as mapped immediately to the south-east of this patch - it is a mixture of *Eucalyptus populnea* and cleared.	
Q30 -21.91413338 148.42604902	**Mapped RE:** 11.9.4/11.9.5 **Ground-truthed RE:** 11.9.7 **VM Act Status:** Of Concern **Biodiversity Status:** Of Concern **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 40% cover. Height range 12-18m; median height 15m. Dominant species: *Eucalyptus populnea.* **Sub-canopy (T2):** n/a **Shrub:** n/a **Groundcover:** n/a **Notes:** RE mapping discrepancies (ground-truthed as not SEVT or Brigalow). Ground-truthed as not SEVT or Brigalow TEC.	None available
Q31 -21.91630363 148.41923193	**Mapped RE:** 11.9.4/11.9.5 **Ground-truthed RE:** 11.9.7 **VM Act Status:** Of Concern **Biodiversity Status:** Of Concern **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 30% cover. Height range 10-15m; median height 12m. Dominant species: *Eucalyptus populnea.* **Sub-canopy (T2):** 15% cover. Height range 6-10m; median height 8m. Dominant species: *Acacia harpophylla.* **Shrub:** n/a **Groundcover:** n/a **Notes:** RE mapping discrepancies (ground-truthed as not SEVT or Brigalow). Ground-truthed as not SEVT or Brigalow TEC.	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q32 -21.91487937 148.42366939	**Mapped RE:** 11.9.4/11.9.5 **Ground-truthed RE:** 11.9.7 **VM Act Status:** Of Concern **Biodiversity Status:** Of Concern **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 30% cover. Height range 12-17m; median height 15m. Dominant species: *Eucalyptus populnea, Eucalyptus cambageana.* **Sub-canopy (T2):** n/a **Shrub:** n/a **Groundcover:** n/a **Notes:** RE mapping discrepancies (ground-truthed as not SEVT or Brigalow). Ground-truthed as not SEVT or Brigalow TEC.	None available
Observation Site (not TEC) – Waypoint 72 -21.8994213 148.44045684	**Mapped RE:** 11.9.3/11.9.7 **Ground-truthed RE:** Non-remnant **VM Act Status:** n/a **Biodiversity Status:** n/a **EPBC Act Status:** Not listed	**Brief description:** regrowth woodland. **Canopy (T1):** 1% cover. Height range 12-25m; median height 18m. Dominant species: *Eucalyptus cambageana.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** Dominated by *Cenchrus ciliaris.* **Notes:** RE mapping discrepancies (ground-truthed as non-remnant). Ground-truthed as not Native Grassland TEC.	
Q36 -21.94420204 148.31678160	**Mapped RE:** 11.3.2/11.3.1 **Ground-truthed RE:** 11.3.4 **VM Act Status:** Of Concern **Biodiversity Status:** Of Concern **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 10% cover. Height range 15-25m; median height 20m. Dominant species: *Corymbia tessellaris, Eucalyptus crebra.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** Ground-truthed as not Brigalow TEC.	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q37 -21.94457000 148.31782364	**Mapped RE:** 11.3.2/11.3.1 **Ground-truthed RE:** 11.5.3 **VM Act Status:** Least Concern **Biodiversity Status:** No Concern at Present **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 25% cover. Height range 12-22m; median height 17m. Dominant species: *Eucalyptus populnea, Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** RE mapping discrepancies (ground-truthed as not Endangered or Of Concern RE). Ground-truthed as not Brigalow TEC.	
Q38 -21.93900006 148.30675383	**Mapped RE:** 11.5.3 **Ground-truthed RE:** 11.4.9 but < 0.5 ha **VM Act Status:** n/a **Biodiversity Status:** n/a **EPBC Act Status:** Not listed	**Brief description:** Brigalow forest. **Canopy (T1):** 50% cover. Height range 9-12m; median height 10m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** Ground-truthed as Endangered RE, although patch not large enough to be mapped. Ground-truthed as not Brigalow TEC (<0.5 ha).	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q42 -21.94764230 148.32437787	**Mapped RE:** Non-Remnant; adjacent to 11.3.2/11.3.1 **Ground-truthed RE:** 11.3.4 **VM Act Status:** Of Concern **Biodiversity Status:** Of Concern **EPBC Act Status:** Not listed	**Brief description:** Eucalypt woodland. **Canopy (T1):** 30% cover. Height range 15-25m; median height 20m. Dominant species: *Corymbia tessellaris, Eucalyptus crebra.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** RE mapping discrepancies (ground-truthed as remnant). Ground-truthed as not Brigalow TEC.	
Q43 -21.94008912 148.37610511	**Mapped RE:** 11.5.3/11.7.2 **Ground-truthed RE:** 11.4.9 but < 0.5 ha **VM Act Status:** n/a **Biodiversity Status:** n/a **EPBC Act Status:** Not listed	**Brief description:** Brigalow forest. **Canopy (T1):** 50% cover. Height range 9-12m; median height 10m. Dominant species: *Acacia harpophylla.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** Ground-truthed as Endangered RE, although patch not large enough to be mapped. Ground-truthed as not Brigalow TEC (<0.5 ha).	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q47 -21.94481090 148.35693972	**Mapped RE:** 11.5.3/11.7.2 **Ground-truthed RE:** 11.4.9 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Not listed	**Brief description:** Brigalow-Belah forest. **Canopy (T1):** 70% cover. Height range 15-24m; median height 19m. Dominant species: *Casuarina cristata.* **Sub-canopy (T2):** n/a. **Shrub:** n/a. **Groundcover:** n/a. **Notes:** RE mapping discrepancies (ground-truthed as Endangered RE). Ground-truthed as not Brigalow TEC (Brigalow not dominant or co-dominant in this patch). Gully.	
Q57 -21.92793 148.39719	**Mapped RE:** 11.9.5/11.9.1 **Ground-truthed RE:** 11.9.5/11.9.1 **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Not listed	**Brief description:** Belah-Eucalypt open forest. **Canopy (T1):** Height range 18-21m; median height 20m. Dominant species: *Eucalyptus cambageana, Casuarina cristata.* **Sub-canopy (T2):** Height range 8-10m; median height 9m. Dominant species: *Pouteria sp., Denhamia oleaster, Notelaea sp., Casuarina cristata.* **Shrub:** Height range 1-2m; median height 1.5m. Dominant species: *Acalypha eremorum, Casuarina cristata.* **Groundcover:** n/a. **Notes:** Confirmed as Endangered RE. Ground-truthed as not Brigalow TEC (Brigalow not dominant or co-dominant in this patch).	

Site	RE and Status	Dominant flora species (*= exotic species)	Representative photographs
Q58 -21.88193 148.24558	**Mapped RE:** Non-remnant **Ground-truthed RE:** Regrowth **VM Act Status:** n/a **Biodiversity Status:** n/a **EPBC Act Status:** Not listed	**Brief description:** Regrowth Brigalow. **Canopy (T1):** Height range 1.5-7m; median height 4m. Dominant species: *Acacia harpophylla.* Associated species: *Eremophila mitchellii, Acalypha eremorum.* Emergent species: *Eucalyptus populnea.* **Sub-canopy (T2):** n/a. **Shrub:** Height range 0.1-0.6m; median height 0.5m. Dominant species: *Carissa ovata.* **Groundcover:** Dominant species: *Cenchrus ciliaris, Bothoriochloa pertusa, Chloris virgata.* **Notes:** Ground-truthed as not Brigalow TEC (ground layer >50% exotic grasses).	

APPENDIX D
Modelled and ground-truthed threatened fauna habitat maps

Figures 5.2a-f Modelled and Ground-truthed Ornamental Snake Habitat within the Dragline Transportation Route

Figures 5.3a-f Modelled and Ground-truthed Squatter Pigeon (Southern Subspecies) Habitat within the Dragline Transportation Route

Figures 5.4a-f Modelled and Ground-truthed Koala Habitat within the Dragline Transportation Route

Figures 5.5a-f Modelled and Ground-truthed Yakka Skink Habitat within the Dragline Transportation Route

148°0'E

Goonyella Riverside Mine

Map 5.2a
Map 5.2b
Map 5.2c
Map 5.2d
Map 5.2e
Map 5.2f

bing™

21°50'S

148°0'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Figure: 5.2a
Title: Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

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Drawn By: MG Reviewed by: AC Date: 20-Sep-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 20-Sep-16 11:16:24 PM

148°10'E

21°50'S

148°10'E

21°50'S

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 20-Sep-16

Figure:	5.2b
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 20-Sep-16 11:16:24 PM

Notes:
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Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

- General Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 20-Sep-16

Figure:	5.2c
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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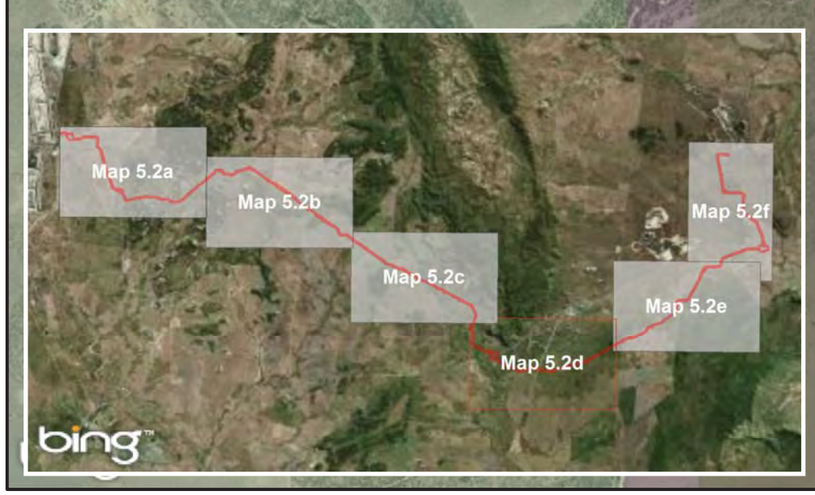
Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 20-Sep-16 11:16:24 PM

148°20'E



148°20'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

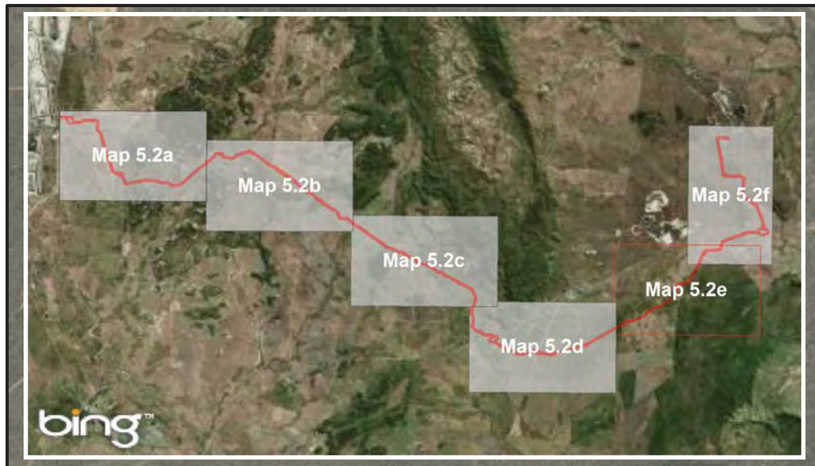
- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat

- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 20-Sep-16

Figure:	5.2d
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS



bing

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

- Essential Habitat
- General Habitat
- Unlikely Habitat

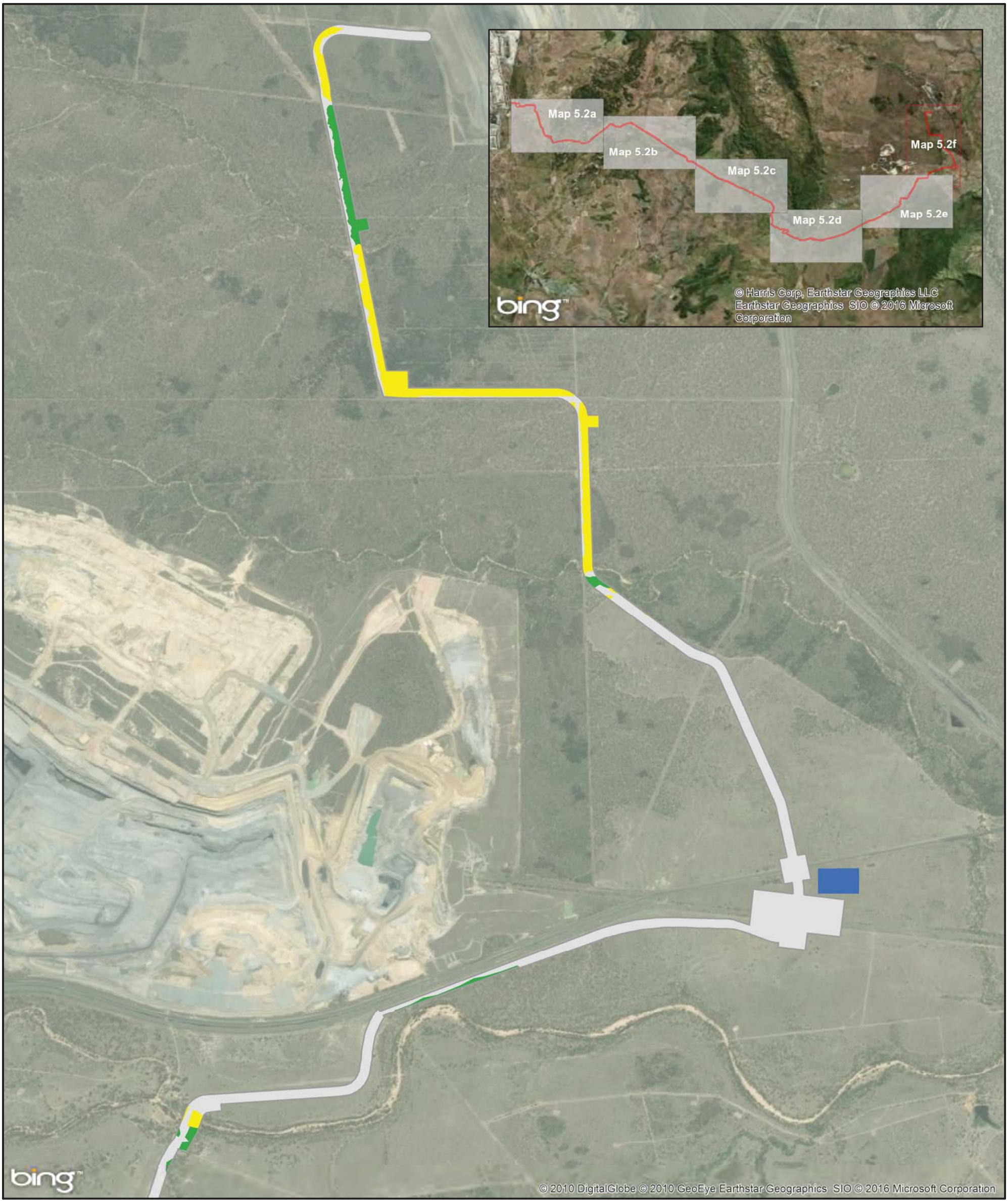
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 20-Sep-16

Figure:	5.2e
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 20-Sep-16 11:16:24 PM



Notes:

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 0.15 0.3 0.6 0.9 1.2 Kilometers

Legend

Ornamental Snake Habitat

- Essential Habitat
- General Habitat
- Unlikely Habitat

- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Portrait_dragline.mxdDate: 21-Sep-16 1:00:30 AM

Figure: **5-2f**
Title: Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route

Project: **BMC Dragline Move Project**
Terrestrial Ecology MNES Assessment

Client: **Client LOGO or name**

BAAM ECOLOGICAL CONSULTANTS

148°0'E

Goonyella Riverside Mine

Map 5.3a
Map 5.3b
Map 5.3c
Map 5.3d
Map 5.3e
Map 5.3f

bing™

21°50'S

148°0'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure: 5.3a
Title: Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

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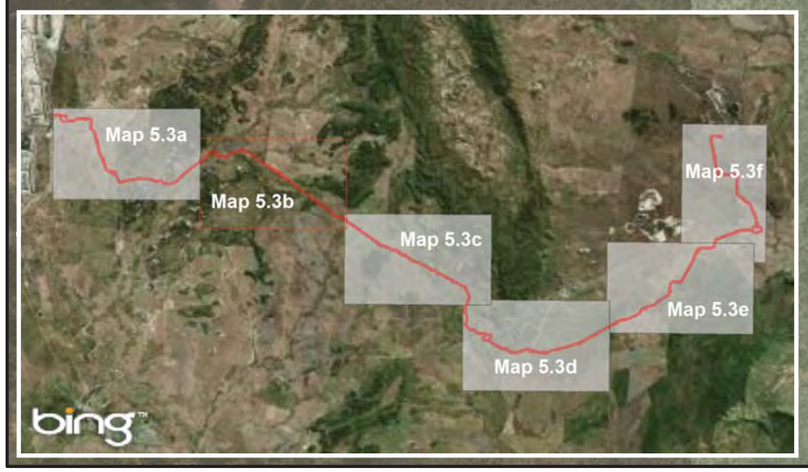
Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 20-Sep-16 11:16:24 PM

148°10'E

21°50'S



148°10'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.3b
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat

Dragline Corridor Revision C

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.3c
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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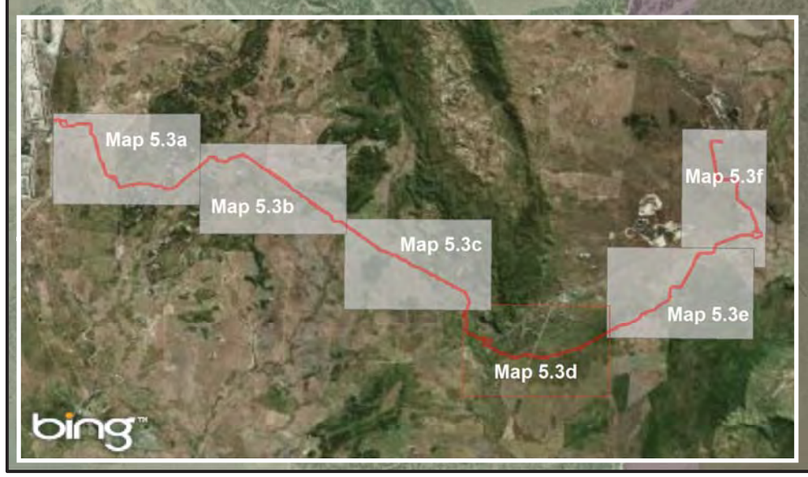
148°20'E



148°20'E

Notes:

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat

- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.3d
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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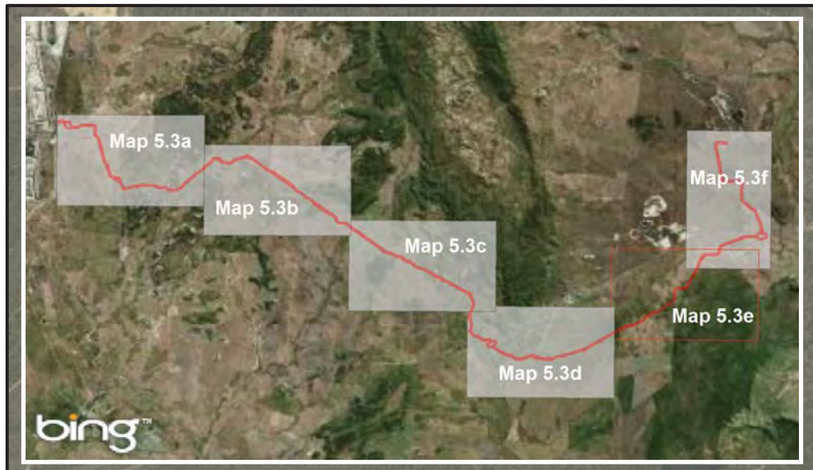

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Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat

Dragline Corridor Revision C

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.3e
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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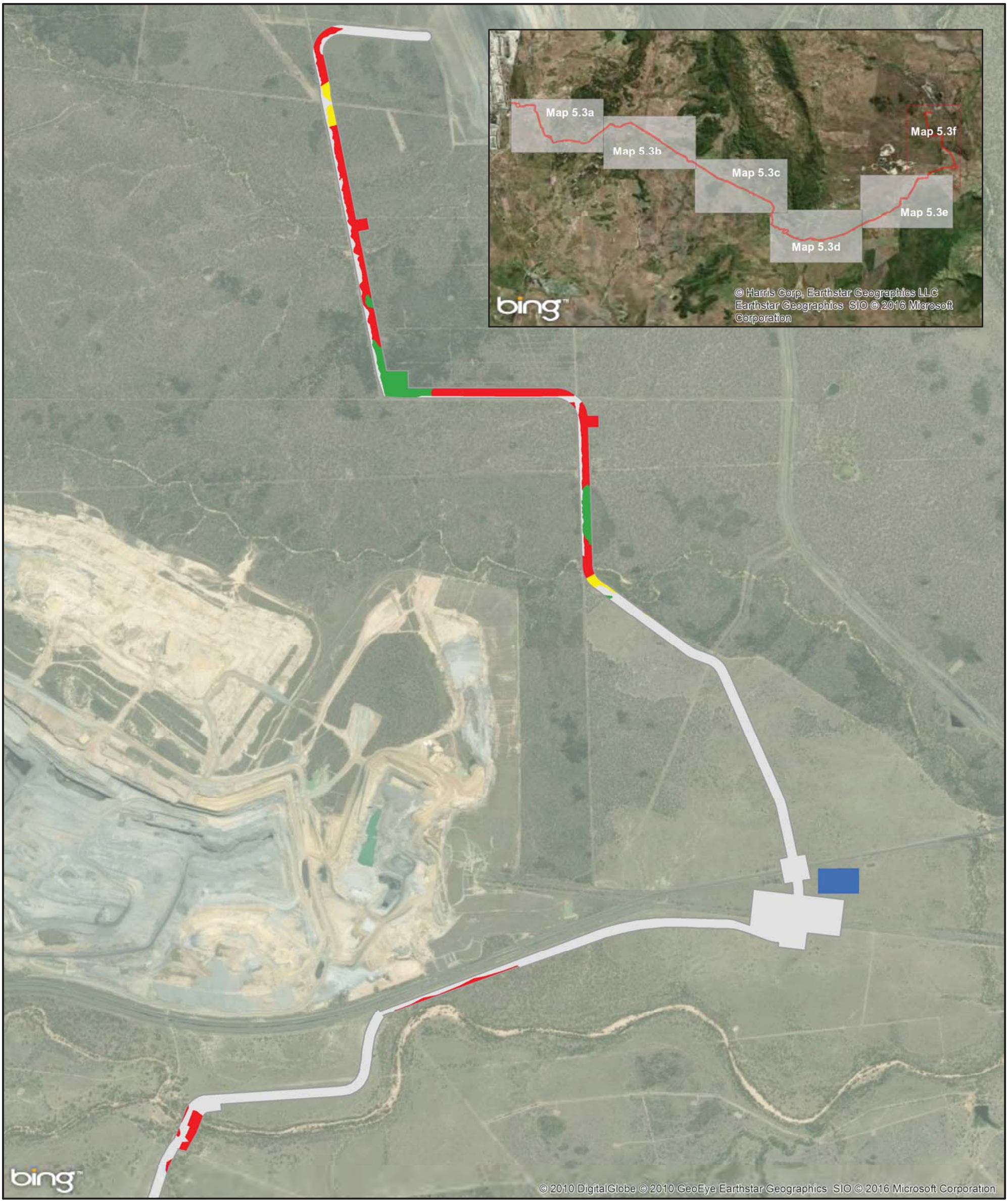

Notes:

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 0.15 0.3 0.6 0.9 1.2 Kilometers

Legend

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Portrait_dragline.mxdDate: 21-Sep-16 1:00:30 AM

Figure:	**5-3f**
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	**BMC Dragline Move Project Terrestrial Ecology MNES Assessment**
Client:	**Client LOGO or name**

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148°0'E

Goonyella Riverside Mine

21°50'S

Map 5.4a
Map 5.4b
Map 5.4c
Map 5.4d
Map 5.4e
Map 5.4f

bing™

148°0'E

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Koala

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure: 5.4a
Title: Modelled and ground-truthed Koala habitat within the Dragline Route

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

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Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 20-Sep-16 11:16:24 PM

148°10'E

21°50'S

148°10'E

21°50'S

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Koala

- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure: 5.4b
Title: Modelled and ground-truthed Koala habitat within the Dragline Route

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

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Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Koala

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.4c
Title:	Modelled and ground-truthed Koala habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

148°20'E

148°20'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Koala

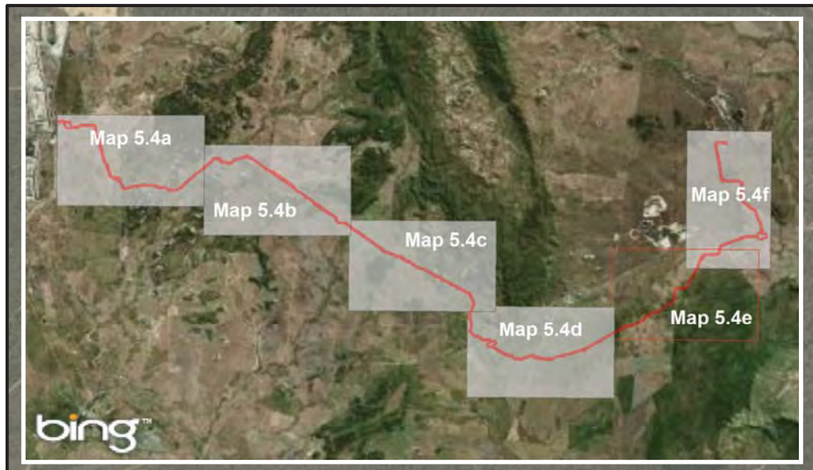
- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.4d
Title:	Modelled and ground-truthed Koala habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 21-Sep-16 12:10:23 AM



bing™

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

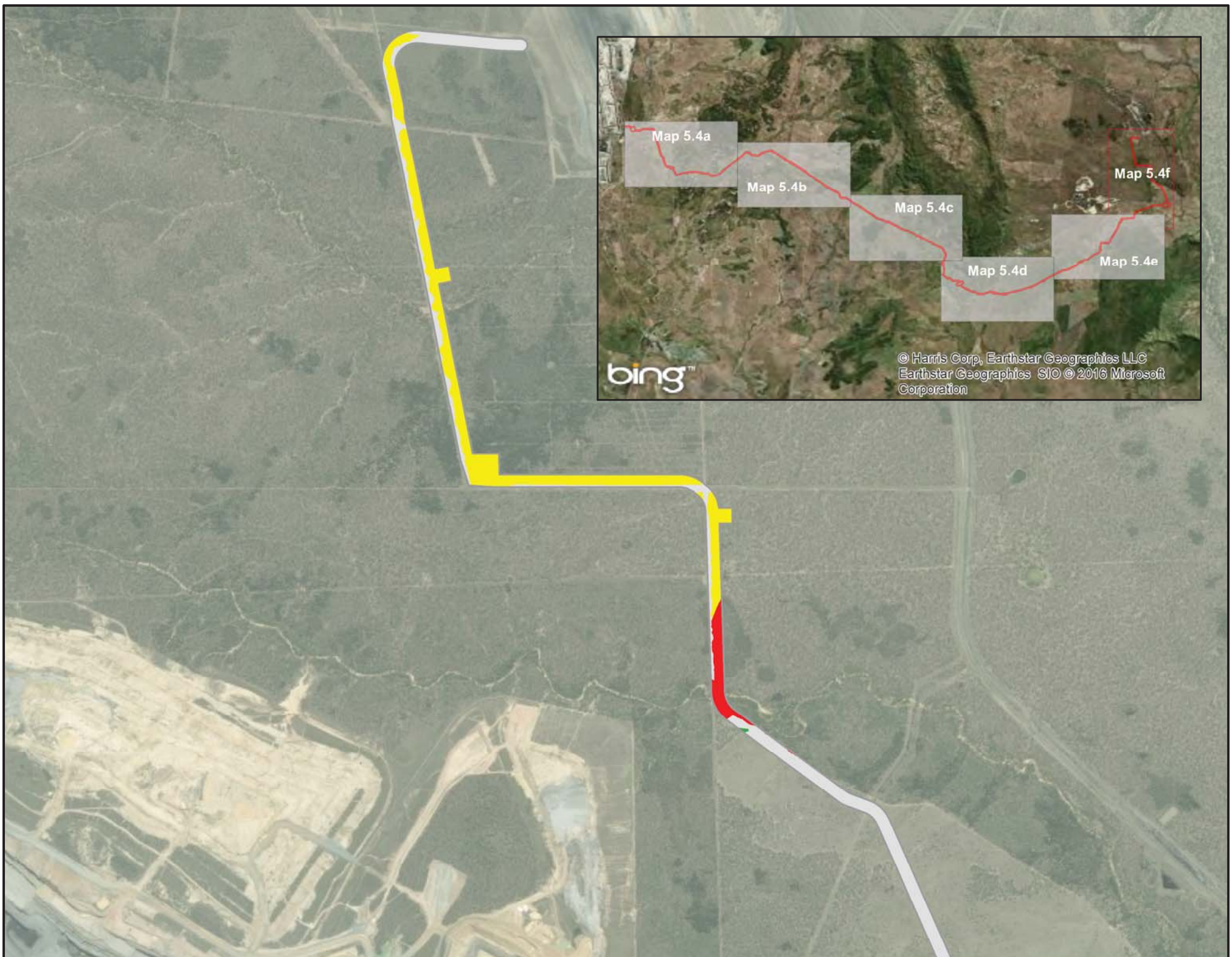
Koala

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.4e
Title:	Modelled and ground-truthed Koala habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS



Notes:

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 0.15 0.3 0.6 0.9 1.2
Kilometers

Legend

Koala

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Portrait_dragline.mxdDate: 21-Sep-16 1:00:30 AM

Figure: **5-4f**
Title: Modelled and ground-truthed Koala habitat within the Dragline Route

Project: **BMC Dragline Move Project**
Terrestrial Ecology MNES Assessment

Client: **Client LOGO or name**

BAAM ECOLOGICAL CONSULTANTS

148°0'E

Goonyella Riverside Mine

21°50'S

Map 5.5a
Map 5.5b
Map 5.5c
Map 5.5d
Map 5.5e
Map 5.5f

bing™

148°0'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure: 5.5a
Title: Modelled and ground-truthed Yakka Skink habitat within the Dragline Route

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

BAAM ECOLOGICAL CONSULTANTS

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 21-Sep-16 12:10:23 AM

148°10'E

21°50'S

148°10'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure: 5.5b
Title: Modelled and ground-truthed Yakka Skink habitat within the Dragline Route

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

BAAM ECOLOGICAL CONSULTANTS

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 21-Sep-16 12:10:23 AM

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink

Essential Habitat

Unlikely Habitat

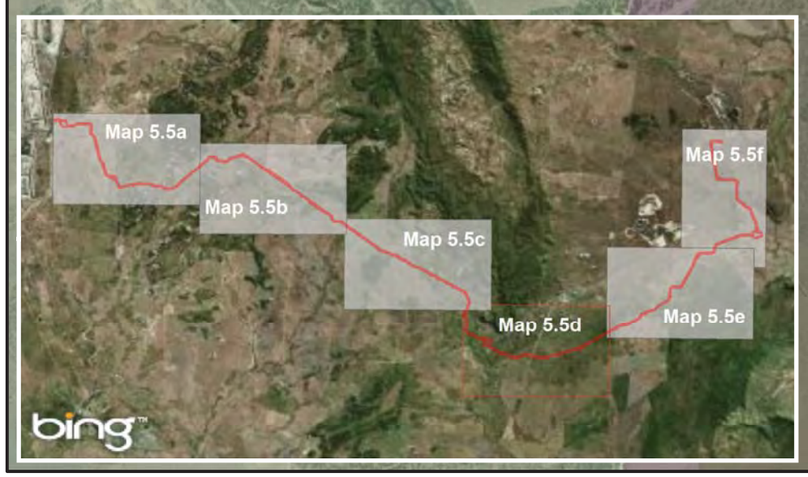
Dragline Corridor Revision C

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.5c
Title:	Modelled and ground-truthed Yakka Skink habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

148°20'E



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Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink

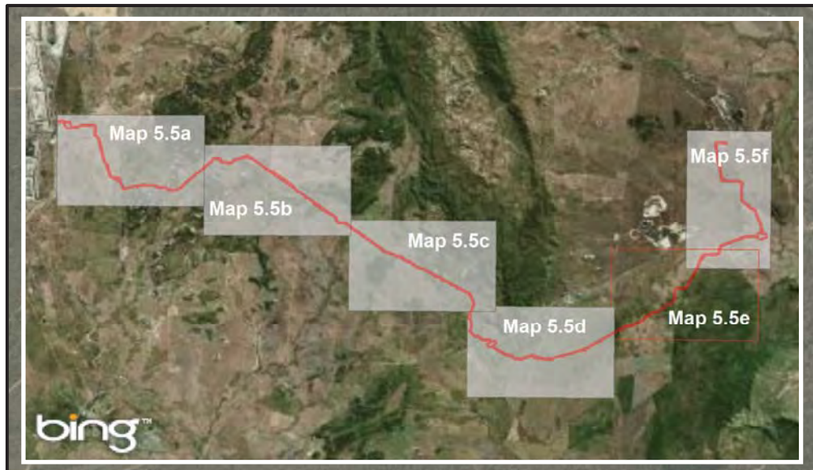
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.5d
Title:	Modelled and ground-truthed Yakka Skink habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series_Dragline.mxdDate: 21-Sep-16 12:10:23 AM



bing™

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

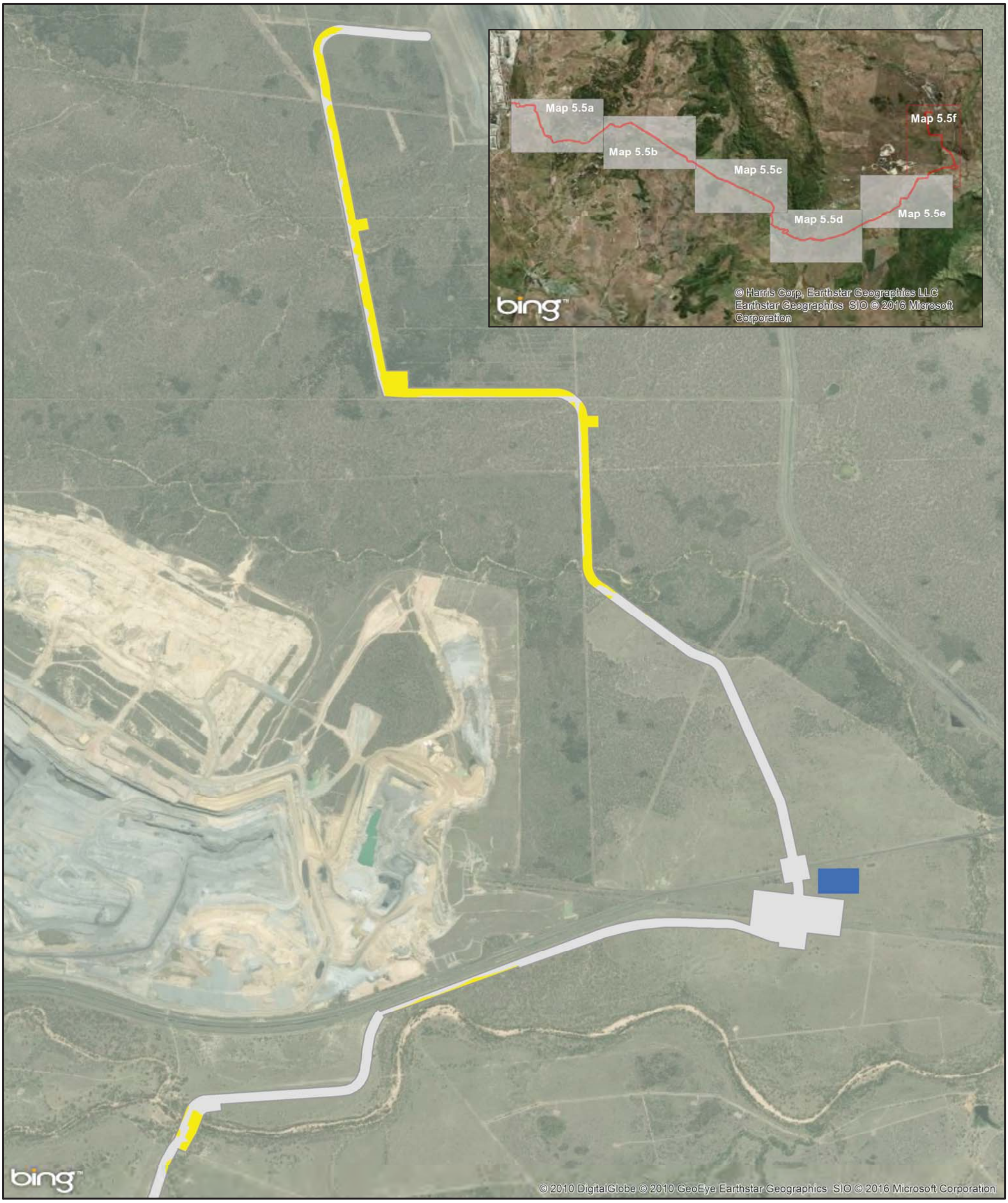
Yakka Skink

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Figure:	5.5e
Title:	Modelled and ground-truthed Yakka Skink habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS



Notes:

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 0.15 0.3 0.6 0.9 1.2 Kilometers

Legend

Yakka Skink

- Essential Habitat
- Unlikely Habitat
- Dragline Corridor Revision C
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 21-Sep-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Portrait_dragline.mxdDate: 21-Sep-16 1:49:00 AM

Figure: **5-5f**
Title: Modelled and ground-truthed Yakka Skink habitat within the Dragline Route

Project: **BMC Dragline Move Project**
Terrestrial Ecology MNES Assessment

Client: **Client LOGO or name**

BAAM ECOLOGICAL CONSULTANTS

APPENDIX E
EPBC Act Assessment of Significant Impacts – Listed Threatened Ecological Communities and Threatened and Migratory Species

Table E.1 Brigalow (*Acacia harpophylla* dominant and co-dominant communities) assessment against Significant Impact Guidelines 1.1

Table E.2 Ornamental Snake *Denisonia maculata* assessment against significant Impact Guidelines 11

Table E.3 Squatter Pigeon (Southern Subspecies) *Geophaps scripta scripta* assessment against Significant Impact Guidelines 1.1

Table E.4 Koala *Phascolarctos cinereus* assessment against Significant Impact Guidelines 1.1 & EPBC Act referral guidelines for the vulnerable koala

Table E.5 Yakka Skink *Egernia rugosa* assessment against Significant Impact Guidelines 1.1

Table E.6 EPBC Act Assessment of Impact Significance on Listed Migratory Species in the Project Area

Table E.1 Brigalow (*Acacia harpophylla* dominant and co-dominant) assessment against Significant Impact Guidelines 1.1

Criteria	Assessment of Impact Significance
An action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility that it will:	**Brigalow (*Acacia harpophylla* dominant and co-dominant) communities** ***Description*** Brigalow is the commonly accepted name for the species *Acacia harpophylla* and the vegetation in which this species is dominant or co-dominant. Brigalow is either dominant in the tree layer or co-dominant with other species such as Belah *Casuarina cristata*, other species of Acacia, or Eucalyptus species (Butler, 2007). The structure of the community ranges from open forest to open woodland with a tree layer between about 9 m in low rainfall areas to 25 m in higher rainfall areas (Butler, 2007). A prominent shrub layer is usually present often comprising vine thicket species such as *Geijera parviflora, Pittosporum angustifolium, Melaleuca bracteata, Alectryon oleofolious* subsp*. elongatus, Alectryon diversifolius, Elaeodendron australe* var*. integrifolium, Ehretia membranifolium* as well as the weed *Optuntia stricta.* Ground cover percentage is variable with typical species being *Paspalidium caespitosum, Ancistrachne uncinulata, Aristida* spp., *Enychleana tomentosa, Rhagodia spinescens, Einadia hastata,* and *Solanum parvifolium,* although *Harrisia martini** and *Bryophyllum delagoense** may be typically abundant. The Brigalow ecological community occurs roughly within the 500-750 mm annual rainfall belt with a predominance of summer rainfall (Butler, 2007). Community condition is impacted by edge effects created by massive fragmentation with invasion of declared weed species such as *Opuntia stricta* and *O. tomentosa** and *Harrisia martini** together with canopy gaps, caused by canopy dieback and senescence in the absence of recruitment (TSSC 2001a). ***Distribution*** The ecological community extends from south of Charters Towers in Queensland, in a broad swathe east of Blackall, Charleville and Cunnamulla, south to northern New South Wales near Narrabri and Bourke. In Queensland, it occurs predominantly within the Brigalow Belt North, Brigalow Belt South, Darling Riverine Plains and Southeast Queensland bioregions, with smaller amounts in the Mitchell Grass Downs, Mulga Lands and Einasleigh Uplands bioregions (Butler, 2007). In Queensland, a number of regional ecosystems (REs) are considered to form the Brigalow ecological community. ***Community Assessment Approach*** A desktop study summarised current terrestrial ecological values within the Project area to inform subsequent ground surveys and impact assessment. Data relevant to the distribution and ecology of Brigalow ecosystems was sourced through a number of relevant and publicly available data sources and relevant literature and online sources. This was utilised in conjunction with a review of available aerial imagery and a field survey within the study area, with a subsequent amendments to the Queensland Herbarium vegetation mapping to increase the resolution of available vegetation mapping and add confidence to the assessment of likely impacts to the Brigalow Ecological Community. In accordance with the listing advice, only patches >15 years of age matching a Queensland Regional Ecosystem that is known to correspond to the EPBC-listed community, and in which *Acacia harpophylla* was included as a dominant or co-dominant part of the vegetation were considered to represent the community. Patches that did not meet the condition criteria (i.e. those with ≥50% cover of exotic plants in canopy, shrub or ground layers) were also excluded.

Criteria	Assessment of Impact Significance
	Community Assessment Results Within the Project area this community is restricted to areas ground-truthed as Regional Ecosystems (REs) 11.4.9, 11.9.1 and 11.9.5 dominated by native vegetation in all layers. The mapped occurrence of this community covers an area of approximately 190 ha within the broad area of investigation (a 500 m buffer of the centreline of the study area) (**Figure 5.1**). Eight separate patches were identified in total (one was divided into two subpatches, separated by a narrow track). These patches were found to be either consistent with remnant or mature regrowth and were generally in good condition, with patchy occurrences of Harrisia Cactus, Parthenium and Buffel Grass in association with some patches. The broad investigation area is approximately 8740 ha. Approximately 645 ha of this area are estimated to be impacted by the Project footprint (which equates to 7.4% of the area). Through the application of an unbiased, uniformly distributed clearing model, it would be reasonable to expect that 7.4% of the 190 ha (which equates to approximately 14 ha) of the community within the broad investigation area would be impacted. However, the impact area has been positioned to prioritise the avoidance of the endangered community, as well as other MNES. As a result, the overall impact has been reduced to 9.7 ha (or 5.1%), which is estimated to represent <0.05% of the equivalent REs that correspond to the TEC in the Northern Bowen Basin subregion.
Reduce the extent of an ecological community.	The clearing of vegetation corresponding to the Brigalow (*Acacia harpophylla* dominant and co-dominant) community within the study area is estimated to cover a total area of 9.7 ha. Given its Endangered status under Commonwealth legislation, any reduction in the extent of this ecological community is a significant impact that cannot be reduced to acceptable levels through the mitigation of impacts on retained patches. Therefore, the proposed must **be considered to have a significant impact** in this category.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	The Project footprint has been sited to avoid fragmentation of any patches of the community, with one exception. A patch identified as being consistent with RE 11.4.9 in South Walker Creek will be fragmented into two patches. The patch is approximately 13 ha in size and currently consists two subpatches, separated by a 26 m wide track. The project footprint will widen this track to form a total gap of up to 80 m, with a disturbance area of approximately 3 ha. This will result in two separated patches, of approximately 8 ha and 2 ha respectively. For the other seven patches expected to be impacted, disturbance to the community will only remove a portion of the edges of any patch. Nevertheless, the chance of a significant impact due to fragmentation is considered **likely**.
Adversely affect habitat critical to the survival of an ecological community.	The Project footprint requires only the partial clearing of seven discrete patches of the TEC and will not reduce the size of any patch to <0.5 ha. Therefore, all existing patches of this community will be retained in the landscape, and there will not be an overall reduction in habitat critical to the survival of the community. The chance of significant impact in this category is considered to be **unlikely**.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of	The transport of the dragline will be a one-off impact, requiring a minimal area of groundwork to ensure safe passage. It is not expected to result in changes to hydrology to the extent that the community will be impacted in any way by changes in water or nutrients. In addition, it is not considered to be the type of impact that would results in changes to groundwater levels. Therefore, the likelihood of significant impact in this category is considered to be **unlikely**.

Criteria	Assessment of Impact Significance
surface water drainage patterns.	
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	The Project footprint requires only the partial clearing of seven discrete patches of the TEC and will not reduce the size of any patch to <0.5 ha. Therefore, all existing patches of this community will be retained in the landscape, and there will not be an overall reduction in the extent of the community. The chance of significant impact in this category is considered to be **unlikely**.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – Assisting invasive species, that are harmful to the listed ecological community, to become established; or – Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	The transport of the dragline will be a one-off impact, requiring a defined area clearing and sometimes subsequent groundwork to ensure safe passage. This has the potential to promote the spread of invasive weeds; however weed control measures will be implemented as part of the Environmental Management Plan. The Project is not expected to result in significant changes to the vegetation and it is not expected to compromise the integrity of the community. Therefore, the likelihood of significant impact to the quality of the relevant patches of the community as a result of this Project is considered to be **unlikely**.
Interfere with the recovery of an ecological community.	The Project footprint requires only the partial clearing of seven discrete patches of the TEC and will not reduce the size of any patch to <0.5 ha. Therefore, all existing patches of this community will be retained in the landscape, and there will not be an overall reduction in the extent of the community. The chance of significant impact or interference with the recovery of this community is considered to be **unlikely**.

Table E.2 Ornamental Snake *Denisonia maculata* assessment against Significant Impact Guidelines 1.1

Criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	This species occurs in the Brigalow Belt between Charters Towers and Rockhampton where it is associated with seasonally inundated areas, such as gilgais and channel beds in low-lying areas (Wilson 2005; Wilson and Swan 2008). The species is threatened by habitat loss, fragmentation and degradation, as well as changes to hydrology and water quality, cane toad, predation by feral species and weed invasion (Department of the Environment 2016a). ***Species Assessment*** Data relevant to the habitat, distribution and ecology of the species was sourced through relevant literature and online sources, as well as a number of relevant and publicly available data sources including the Atlas of Living Australia, EPBC online search tool and the Queensland Government Wildnet database. This information, together with a review of aerial photography and existing vegetation mapping by the Queensland Herbarium assisted in the prioritisation of sites for field habitat assessments throughout the Project area during August–September 2016. Determination of the potential occurrence of Ornamental Snake involved a general assessment of habitat features that could potentially support this species. There are several database records in the vicinity of the study area, although the presence of the species could not be confirmed during the field surveys due to the lineal nature and significant size of the study area and the known patchiness of the occurrence of the species. It was considered that a more conservative approach was to model potential habitat and ground-truth the presence of known habitat factors. In ground-truthing modelling results the presence of suitable habitat was confirmed in a number of locations. Modelling and ground-truthing potential habitat in the landscape surrounding the study area (500 m buffer relative to the centre line of the study area corridor) has identified approximately 1235 ha as preferred habitat for Ornamental Snake (comprising 4 ha of core habitat and 1231 ha of essential habitat). The broad investigation area is approximately 8740 ha. Approximately 645 ha of this area are estimated to be impacted by the Project footprint (which equates to 7.4% of the area). Through the application of an unbiased, uniformly distributed clearing model, it would be reasonable to expect that 7.4% of the 1235 ha (which equates to approximately 91 ha) of preferred habitat within the broad investigation area would be impacted. However, the impact area has been positioned to prioritise the avoidance of preferred habitat for MNES. As a result, the overall impact has been reduced to 52.3 ha (or 4.2%), which is estimated to represent approximately 0.1% of the equivalent remnant REs that correspond to preferred habitat for this species in the Northern Bowen Basin subregion.
Lead to a long-term decrease in the size of an important population of a species.	There are several database records from the vicinity of the study area. Given that the species is patchy in the surrounding landscape, it must be considered that there is potential for the population in the study area to be an important population. Therefore, there is **potential** for a significant impact leading to a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore there is a **potential** that the proposed activity would result in reducing the overall area of occupancy of an important population.
Fragment an existing important population into two or more populations.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in fragmentation of an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	The width of the disturbance is expected to be confined to approximately 40 metres in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to adversely affect habitat critical to the survival of a species.

Criteria	Assessment of significance
Disrupt the breeding cycle of an important population.	There are several database records from the vicinity of the study area. Given that the species is patchy in the surrounding landscape, it must be considered that there is potential for the population in the study area to be an important population and that the breeding cycle of such a population could potentially be impacted. Therefore, there is **potential** for a disruption to the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. In addition, suitable habitat is patchy, but widespread across the broader study area (**Figure 5.2**). Therefore the activity is expected to be **unlikely** to result in significant modification, destruction, isolation or limits to availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Wherever possible, the route of the proposed dragline move follows that of a previous dragline move which was undertaken approximately 16 years prior to this assessment. It is a not anticipated that the currently proposed move will result in an increase in invasive predators or weeds in addition to those that are already widespread and established in the potential habitat for this species and the chances of a significant impact in this category are considered to be **unlikely**.
Introduce disease that may cause the species to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in introducing a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The corridor of the proposed dragline move follows that of a previous dragline move, which was undertaken approximately 16 years prior to this assessment, with minimal deviation from the previous route. The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore, whilst the study area may support an important population of the species, it is considered **unlikely** that the proposed impact would interfere substantially with the recovery of the species.

Table E.3 Squatter Pigeon (Southern Subspecies) *Geophaps scripta scripta* assessment against Significant Impact Guidelines 1.1

Criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Squatter Pigeon southern occurs singly, in pairs or in small groups in grassy woodland habitats throughout its range (Pizzey and Knight 2004). Its distribution has suffered a significant contraction since European settlement and it is threatened by habitat loss, fragmentation and degradation, as well as predation and weed invasion (Department of the Environment 2016b). ***Species Assessment*** Data relevant to the habitat, distribution and ecology of the species was sourced through relevant literature and online sources and a number of relevant and publicly available data sources including the Atlas of Living Australia, EPBC online search tool and the Queensland Government Wildnet database. This information, together with a review of aerial photography and existing vegetation mapping by the Queensland Herbarium assisted in the prioritisation of sites for field habitat assessments throughout the Project area during August–September 2016. Determination of the potential occurrence of Squatter Pigeon involved timed bird surveys throughout the study area, as well as opportunistic observations on foot and from a vehicle. Numerous database records have been obtained for the study area and several sightings were made during the field survey. This indicates that the species is relatively prevalent in the study area, just as it is across much of central and north Queensland (a different subspecies occurs even further north). Modelling and ground-truthing vegetation mapping in the landscape surrounding the study area (500 m buffer relative to the centre line of the study area corridor) has identified approximately 3354 ha as preferred habitat for Squatter Pigeon (comprising 2167 ha of core habitat and 1187 ha of essential habitat). The broad investigation area is approximately 8740 ha. Approximately 645 ha of this area are estimated to be impacted by the Project footprint (which equates to 7.4% of the area). Through the application of an unbiased, uniformly distributed clearing model, it would be reasonable to expect that 7.4% of the 3354 ha (which equates to approximately 263 ha) of preferred habitat within the broad investigation area would be impacted. However, the impact area has been positioned to prioritise the avoidance of preferred habitat for MNES. As a result, the overall impact has been reduced to 89.2 ha (or 2.6%), which is estimated to represent approximately <0.05% of the equivalent remnant REs that correspond to preferred habitat for this species in the Northern Bowen Basin subregion.
Lead to a long-term decrease in the size of an important population of a species.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. There is ample habitat for Squatter Pigeon in the broader landscape and it is considered **unlikely** that a total clearing area of up to 89 ha with a narrow width of this nature would lead to a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. There will only be a minor loss of habitat in a landscape that otherwise contains abundant resources for Squatter Pigeon. Therefore the activity is expected to be **unlikely** to result in reducing the overall area of occupancy of an important population.
Fragment an existing important population into two or more populations.	Squatter Pigeon (southern) across the remainder of its range, at least in central and north Queensland is expected to represent a single population. It is considered that the study area occupies a very minor portion of the habitat occupied by this population. The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. There will only be a minor loss of habitat in the landscape and it is not expected to create a barrier for the species given the tendency for individuals to disperse readily into and across areas of non-remnant vegetation. Therefore the activity is expected to be **unlikely** to result in fragmentation of an existing important population into two or more populations.

Criteria	Assessment of significance
Adversely affect habitat critical to the survival of a species	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Squatter Pigeon habitat is widespread in the overall landscape and it is considered **unlikely** that a total clearing area of up to 98 ha with a narrow width of this nature surrounded by a mixture of pastoral land and remnant vegetation would adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in a disruption to the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The width of the disturbance is expected to be confined to approximately 80 m in most areas and the dragline move will be a one-off impact. In addition, suitable habitat is widespread throughout the broader study area (**Figure 5.3**). The Project is not expected to result in any additional barriers to dispersal or significant isolation and exposure to individual koalas in a landscape that is already a mixture of pastoral land and predominantly sparse remnant vegetation. Therefore the activity is expected to be **unlikely** to result in significant modification, destruction, isolation or limits to availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Wherever possible, the route of the proposed dragline move follows that of a previous dragline move which was undertaken approximately 16 years prior to this assessment. It is a not anticipated that the currently proposed move will result in an increase in invasive predators or weeds in addition to those that are already widespread and established in the potential habitat for this species and the chances of a significant impact in this category are considered to be **unlikely**.
Introduce disease that may cause the species to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in introducing a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	Squatter Pigeon (Southern Subspecies) across the remainder of its range, at least in central and north Queensland is expected to represent a single population. It is considered that the study area occupies a very minor portion of the habitat occupied by this population. The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. There will only be a minor overall loss of habitat in a landscape with abundant resources for Squatter Pigeon. Therefore the activity is expected to be **unlikely** to interfere substantially with the recovery of the species.

Table E.4 Koala *Phascolarctos cinereus* assessment against Significant Impact Guidelines 1.1 & EPBC Act referral guidelines for the vulnerable koala (Department of the Environment 2014)

Criteria	Assessment of significance
Assessing adverse effects on habitat critical to the survival of the Koala.	A habitat score of 9 was determined for Koala habitat within the impact area (see Table 5.1 of main report), the area proposed to be cleared contains known Koala food trees and an area ≥20 ha is proposed to be cleared within areas of known Koala food trees with a habitat score ≥8, therefore referral of the project is recommended and in addition to assessment against the Significant Impact Guidelines 1.1, Section 8 of the referral guidelines must be addressed (see below).
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Koala food trees are prevalent in the overall landscape and it is considered **unlikely** that a total clearing area of up to 98 ha within a narrow corridor of this nature surrounded by a mixture of pastoral land and remnant vegetation would lead to a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. The Koala population in the vicinity of the study area is expected to be small and at a low density. There will only be a minor loss of habitat in a landscape that otherwise contains abundant resources for Koala. Therefore the activity is expected to be **unlikely** to result in reducing the overall area of occupancy of an important population.
Fragment an existing important population into two or more populations.	The Koala population in the vicinity of the study area is expected to be small and at a low density. A higher density population of Koala is present to the east in the vicinity of the Eton Range near Nebo. It is considered that the study area is located broadly on the margins of a larger Koala population to the east. Therefore the activity is expected to be **unlikely** to result in fragmentation of an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Koala food trees are prevalent in the overall landscape and it is considered **unlikely** that a total clearing area of up to 98 ha with a narrow width of this nature surrounded by a mixture of pastoral land and remnant vegetation would adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in a disruption to the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. In addition, suitable habitat is widespread throughout the broader study area (**Figure 5.4**). The Project is not expected to result in any additional barriers to dispersal or significant isolation and exposure to individual koalas in a landscape that is already a mixture of pastoral land and predominantly sparse remnant vegetation. Therefore the activity is expected to be **unlikely** to result in significant modification, destruction, isolation or limits to availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable	Wherever possible, the route of the proposed dragline move follows that of a previous dragline move which was undertaken approximately 16 years prior to this assessment. It is a not anticipated that the currently proposed move will result in an increase in invasive predators or weeds in addition to those that are already widespread and established in the potential habitat for this species and the chances of a significant impact in this category are considered to be **unlikely**.

Criteria	Assessment of significance
species' habitat.	
Introduce disease that may cause the species to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in introducing a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The Koala population in the vicinity of the study area is expected to be small and at a low density. A higher density (important) population of Koala is present to the east in the vicinity of the Eton Range near Nebo. It is considered that the study area is located broadly on the margins of a larger Koala population to the east. The Project is not expected to result in any additional barriers to dispersal or significant isolation and exposure to individual koalas in a landscape that is already a mixture of pastoral land and predominantly sparse remnant vegetation. In addition, ample food sources for Koala are present in the landscape. Therefore the activity is expected to be **unlikely** to interfere substantially with the recovery of the species.
Could the action interfere substantially with the recovery of the koala?	
Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.	The project will not introduce any new human populations and associated dogs to the study area, therefore no increase in koala fatalities from dog attacks as a result of the project is predicted.
Increasing Koala fatalities in habitat critical to the survival of the Koala due to vehicle-strikes to a level that is likely to result in multiple, on-going mortalities.	There will be construction traffic during preparation of the dragline transport route for a once-off dragline move. Once the dragline has been moved, there will be no ongoing road traffic associated with the project. The Environmental Management Plan will include measures for reducing the potential impacts of construction traffic on fauna. No increase in Koala fatalities from vehicle strikes as a result of the project is predicted.
Facilitating the introduction or spread of disease or pathogens for example Chlamydia *or Phytophthora cinnamomi*, to habitat critical to the survival of the Koala, that are likely to significantly reduce the reproductive output of Koalas or reduce the carrying capacity of the habitat.	Habitat within and surrounding the project area is highly fragmented and intersected by many roads and tracks, therefore there is no opportunity for the project actions to result in exposure of habitats to pathogens that are not already present in the wider environment. The Environment Management Plan will include measures for ensuring that all vehicles and equipment are washed down prior to working within the dragline transportation route, limiting the possibility for the introduction or spread of disease or pathogens.
Creating a barrier to movement to, between or within habitat critical to the	The project does not include any excavations or the construction of any structures that would create a barrier to Koala movement.

Criteria	Assessment of significance
survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala.	
Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long term.	Where the dragline transport route crosses waterways, there is a commitment to stabilise creel banks and reinstate the riparian vegetation, including trees suitable for Koala feed and shelter. There will be no impacts of the project on hydrological conditions that would lead to degradation of Koala habitat.

Table E.5 Yakka Skink *Egernia rugosa* assessment against Significant Impact Guidelines 1.1

Criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	**Yakka Skink *Egernia rugosa*** Yakka Skink lives in colonies, occupying communal burrows, often under dead timber or deep rock crevices. These skinks are found in dry open forests and woodlands, usually on coarse gritty soils that are well drained, although colonies have been recorded in a wider variety of habitats (Ehmann 1992; Cogger 2000; Drury 2001; Wilson 2005). They sometimes occupy old rabbit burrows. The species is threatened by loss of habitat, loss of shelter sites through agricultural practices, too-frequent fire, trampling of burrows by livestock and predation by foxes and cats (Drury 2001). ***Species Assessment*** Data relevant to the habitat, distribution and ecology of the species was sourced through relevant literature and online sources and a number of relevant publicly available data sources including the Atlas of Living Australia, EPBC online search tool and the Queensland Government Wildnet database. This information, together with a review of aerial photography and existing vegetation mapping by the Queensland Herbarium assisted in the prioritisation of sites for field habitat assessments throughout the Project area during August–September 2016. Determination of the potential occurrence of Yakka Skink involved a general assessment of habitat features that could potentially support this species. There are no database records from the Project area and the presence of the species could not be confirmed during the field surveys due to the lineal nature and significant size of the study area and the known patchiness of the occurrence of the species. It was considered that a more conservative approach was to model potential habitat and ground-truth the presence of known habitat factors. In ground-truthing modelling results, the presence of suitable habitat was confirmed in a number of locations. Nevertheless, this is a secretive species that occurs in a variety of habitats and it is considered to have the potential to occur on the basis of its known distribution and habitat preferences. Despite the lack of records, modelling of habitat based on existing vegetation mapping in the landscape surrounding the study area (500 m buffer relative to the centre line of the study area corridor) has identified approximately 3618 ha as preferred habitat for Yakka Skink. The broad investigation area is approximately 8740 ha. Approximately 645 ha of this area are estimated to be impacted by the Project footprint (which equates to 7.4% of the area). Through the application of an unbiased, uniformly distributed clearing model, it would be reasonable to expect that 7.4% of the 3618 ha (which equates to approximately 268 ha) of preferred habitat within the broad investigation area would be impacted. However, the impact area has been positioned to prioritise the avoidance of preferred habitat for MNES. As a result, the overall impact has been reduced to 99.35 ha (or 2.7%), which is estimated to represent approximately 0.0% of the equivalent remnant REs that correspond to preferred habitat for this species in the Northern Bowen Basin subregion.
Lead to a long-term decrease in the size of an important population of a species.	There are no database records from the Project area. However, the species is difficult to detect, the study area is positioned within the centre of the distribution of this species and the species is considered to have potential to occur in the study area. Given that the species is scarce in the surrounding landscape and there is potential for a local population to be present in the study area (i.e. many individuals occupying one or more communal burrows), it is reasonable to consider that there is potential for an important population to occur in the study area, especially in the context of the genetic diversity of the species. Therefore, there is **potential** for a significant impact leading to a long-term decrease in the size of an important population of this species. A pre-clearance survey is recommended (during the summer or autumn) in areas identified as preferred habitat for this species. If the species is located, opportunities for avoidance should be considered in the first instance and relocation of individuals to suitable habitat undertaken if avoidance is not possible.

Criteria	Assessment of significance
Reduce the area of occupancy of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in reducing the overall area of occupancy of an important population.
Fragment an existing important population into two or more populations.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in fragmentation of an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of an important population.	There are no database records from the Project area. However, the species is difficult to detect, the study area is positioned within the centre of the distribution of this species and the species is considered to have potential to occur in the study area. Given that the species is scarce in the surrounding landscape and there is potential for a local population to be present in the study area (i.e. many individuals occupying one or more communal burrows), it is reasonable to consider that there is potential for the study area to support an important population and that the breeding cycle could potentially be impacted. Therefore, there is **potential** for a disruption to the breeding cycle of an important population. A pre-clearance survey is recommended in areas identified as preferred habitat for this species to identify potential burrow locations. If burrows are located and confirmed, opportunities for avoidance should be considered in the first instance and relocation of individuals to suitable habitat undertaken if avoidance is not possible.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. In addition, suitable habitat is widespread throughout the broader study area (**Figure 5.6**). Therefore the activity is expected to be **unlikely** to result in significant modification, destruction, isolation or limits to availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Wherever possible, the route of the proposed dragline move follows that of a previous dragline move which was undertaken approximately 16 years prior to this assessment. It is a not anticipated that the currently proposed move will result in an increase in invasive predators or weeds in addition to those that are already widespread and established in the potential habitat for this species and the chances of a significant impact in this category are considered to be **unlikely**.
Introduce disease that may cause the species to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in introducing a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	Yakka Skink is a widespread, yet scarce species. The study area is located a little to the north of the centre of the species' geographical distribution. It has yet to be confirmed whether the species is present in the vicinity of the study area and the impact area has been sited to avoid areas of remnant vegetation that hold the highest potential habitat value for the species. There remains a possibility that an as yet undetected population of Yakka Skink may be impacted by the Project; however it is considered **unlikely** that an impact in the study area would interfere substantially with the recovery of the species.

Table E.6 EPBC Act Assessment of Impact Significance on Listed Migratory Species in the Project Area

Criteria	Assessment of Significance
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	Based on the assessment of existing terrestrial ecological values documented in the main report and the assessment of likelihood provided in **Appendix A**, the following terrestrial species listed as Migratory under the EPBC Act are currently recognised as known or having potential to occur within the study area: • White-throated Needletail *Hirundapus caudacutus*; • Fork-tailed Swift *Apus pacificus*; • Oriental Cuckoo *Cuculus optatus*. White-throated Needletail and Fork-tailed Swift are predicted to occur in the study area, possibly on an annual basis. Both are aerial species for which the Project area does not represent 'important habitat' and no impacts are expected due to the proposed action as these species forage over a wide variety of land use, including human infrastructure and large waterbodies.
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of *important habitat* for a migratory species.	The impact area has been positioned to avoid all permanent wetlands areas and crosses ephemeral watercourses only where absolutely necessary. None of the impact area is considered to represent important habitat for any migratory fauna. • **Oriental Cuckoo** This species may be an occasional, transient visitor to the study area. It would generally occur in open, wooded habitats. The proposed action is expected to have minimal effects on the migrating population of this species and no important habitat will be modified, destroyed or isolated. Therefore the impact is **unlikely** to be significant.
Result in invasive species that are harmful to the migratory species becoming established in an area of *important habitat* for the migratory species.	As noted above, none of the impact area is considered to represent important habitat for any migratory fauna. Therefore, the impact of the proposed action is **unlikely** to be significant.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an *ecologically significant proportion* of the *population* of a migratory species.	• **Oriental Cuckoo** This species may be an occasional, transient visitor to the study area. It does not breed in Australia. Therefore the impact is **unlikely** to be significant.

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