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Disturbance Limits Approach:

Maules Creek Coal Mine

Prepared for: Maules Creek Coal Pty Ltd

10 September 2021

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PREPARED FOR	Maules Creek Coal Pty Ltd	
AUTHOR/S	Lucas McKinnon and Darren James (DAJ Environmental)	
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Glossary and abbreviations

ACRONYM	DESCRIPTION
BBS	Brigalow Belt South
BMP	Biodiversity Management Plan
CEEC	Critically Endangered Ecological Community
DA	Development Application
DLA	Disturbance Limits Approach
EPBC	Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LP	Liverpool Plains
MCC	Maules Creek Coal Pty Ltd
MCCM	Maules Creek Coal Mine
MNES	Matter of National Environmental Significance
NSW	New South Wales
PA	Project Approval

1. Introduction

1.1 Purpose of this report and legislative context

Conditional approval for the Maules Creek Coal Mine (MCCM) was granted on 11 February 2013 (Maules Creek Coal Mine project [EPBC2011/5566]) by the Commonwealth Government. Condition 6 (a & b) of the approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (**Table 1.1**) requires that the person taking the action must:

- Limit the maximum disturbance for a range of Matters of National Environmental Significance (MNES) values being impacted by the mine footprint
- Provide an independent analysis that demonstrates the maximum disturbance limits which will minimise impacts on the relevant MNES.

Table 1.1: Summary of condition 6 (EPBC 2010/5566).

Condition 6: The person taking the action must submit to the Minister for approval, within three months of the commencement of the action, an approach that		*Section in this report where condition is met*
a	*limits the maximum disturbance (in hectares) specified for each of the years 5, 10, 15 and 21 from the date of this approval of the White Box—Yellow Box—Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and the habitat or potential habitat for the regent honeyeater, swift parrot and greater long-eared bat*	*Section 3.2; Section 4*
b	*incorporates an analysis, undertaken by independent ecological experts approved by the Department, that demonstrates the maximum disturbance limits which will minimise any impacts on relevant matters of national environmental significance*	*Section 3.1; Section 4*
c	*demonstrates collaboration with the person taking the action to develop and operate the Boggabri Coal Project (EPBC 2009/5256), in order to minimise progressive project area disturbance limits across both sites. The progressive disturbance limits are to be reflected in the development of the Leard Forest Mining Precinct Biodiversity Strategy*	*Evidence of collaboration to be provided by Maules Creek Coal Pty Ltd. Not discussed in this DLA*

This report has been prepared to satisfy condition 6a and 6b by:

(1) providing an analysis that demonstrates the maximum approved disturbance limits which aim to minimise impacts on relevant MNES, and

(2) identifying the maximum disturbance anticipated for years 5, 10, 15 and 21. The report has been prepared to include only those MNES relevant to the Project, including:

- The ecological community known as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community (referred to in this report as Box-Gum Grassy Woodland) – critically endangered
- Potential habitat for Regent Honeyeater (*Anthochaera phrygia*) – critically endangered

- Potential habitat Swift Parrot (*Lathamus discolour*) – critically endangered
- Potential habitat Greater Long-eared bat (South-eastern Long-eared bat) (*Nyctophilus corbeni*) – vulnerable

A previous DLA was prepared in 2016 to satisfy the condition (Whitehaven Coal 2016). This DLA replaces the previously prepared DLA.

MCCM intend to mine years 15 and 21 concurrently, with all clearing currently now proposed to take place by year 15. This will, in effect, bring forward the final phase of clearing. In the period since commencing the operation additional geological investigation and resource definition has been undertaken to improve the understanding of the deposit within the Project area. Relevantly, the operation has progressively increased its production rate to the approved 13 Million-tonne-per-annum (Mtpa) maximum capacity and refined its understanding of fleet capabilities, geological conditions, and mine planning requirements. Since the previous DLA analysis in 2016, and the original forecasted schedule for areas presented, the long term mine planning process has identified that the area forecast from Year 15 to Year 21 is required to be incorporated with the Year 15 area.

In satisfying Condition 6a and Condition 6b an assessment of the total amount of impact associated with the approval has been completed. The amount of habitat available for each MNES, within the surrounding 'region', has also been calculated. The following tasks have been undertaken as part of the project:

- Literature review to determine the amount of disturbance approved for each MNES as part of the approval
- Confirmation of the disturbance footprint assessed in the original impact assessment for each MNES
- Calculation of actual impacts now predicted to occur based on current clearing boundary (project footprint)
- Calculation of the area of available habitats for each MNES in the surrounding Interim Bioregionalisation of Australia (IBRA) region and subregion using best available data and information.

Using the above information, the maximum disturbance limits for each MNES were assessed and their suitability reviewed.

1.2 Background

MCCM is managed on behalf of several parties by Maules Creek Coal Pty Ltd (MCC) and is located in the Gunnedah Basin, approximately 18 kilometres (km) to the north-east of Boggabri in the north-west region of New South Wales (**Figure 1.1** and **Figure 1.2**) (MCC 2017). The site is located partially within the boundary of the Leard State Forest, and is situated wholly within the Narrabri Local Government Area (LGA).

1.2.1 Approved clearing

Maximum clearing limits for each MNES are set in the Commonwealth Government's approval (EPBC 2010/5566). Conditions 1 and 2 of EPBC 2010/5566 allow MCC to complete the following clearing as part of the approved mine:

1. The person taking the action must not clear more than 544 hectares (ha) of the EPBC listed White Box—Yellow Box—Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community within the Maules Creek project area, as identified in Attachment A of these conditions;

2. The person taking the action must not clear more than 1665 ha of habitat for the regent honeyeater (Anthochaera phrygia: formerly Xanthomyza phrygia), swift parrot (Lathamus discolor) or greater long-eared bat (Nyctophilus corbeni), within the Maules Creek project area. The 1665 ha of habitat specified includes the 544 ha of the critically endangered ecological community at condition 1.

This report reviews the maximum allowable clearing limits displayed above to determine their suitability, and compares these against the approved footprint supplied by MCC.

1.2.2 Mine site rehabilitation

MCCM will undertake staged rehabilitation of the clearing areas within the project boundary. The aim of the rehabilitation activities is to create landforms that are safe, stable, provide adequate drainage and are of a shape that is consistent with the naturally occurring landforms in the region (MCC 2017).

The key objective of the rehabilitation program is the establishment of native forests and woodlands, with Condition 25 of Approval Decision EPBC 2010/5566 requiring no less than 1,665 ha of native forest and woodland in the project area, including 544 ha using species consistent with Box-Gum Woodland (MCC 2016, 2020). The woodland rehabilitation established will be similar to the following vegetation types that occur in the Project area, and include White Box – White Cypress Pine grassy woodland, Silver-leaved Ironbark heathy woodland, White Box - Narrow-leaved Ironbark – White Cypress Pine grassy open forest, White Box - Narrow-leaved Ironbark – White Cypress Pine shrubby open forest and Dwyer's Red Gum – Ironbark woodland (MCC 2020). The lands will be supplemented with timber, bush rock and salvaged hollow limbs (MCC 2016, 2020). The proposed timing of rehabilitation is provided in Table 1.2.

Table 1.2: Proposed timing of rehabilitation (provided by MCC 2021).

EPBC Year	Calendar Year	Cumulative rehabilitation area (ha)
Year 5	2018	-
Year 10	2023	446
Year 15	2028	620
Year 21 (including Mine Infrastructure Area (MIA) and Wash Plant)	2034	1,665

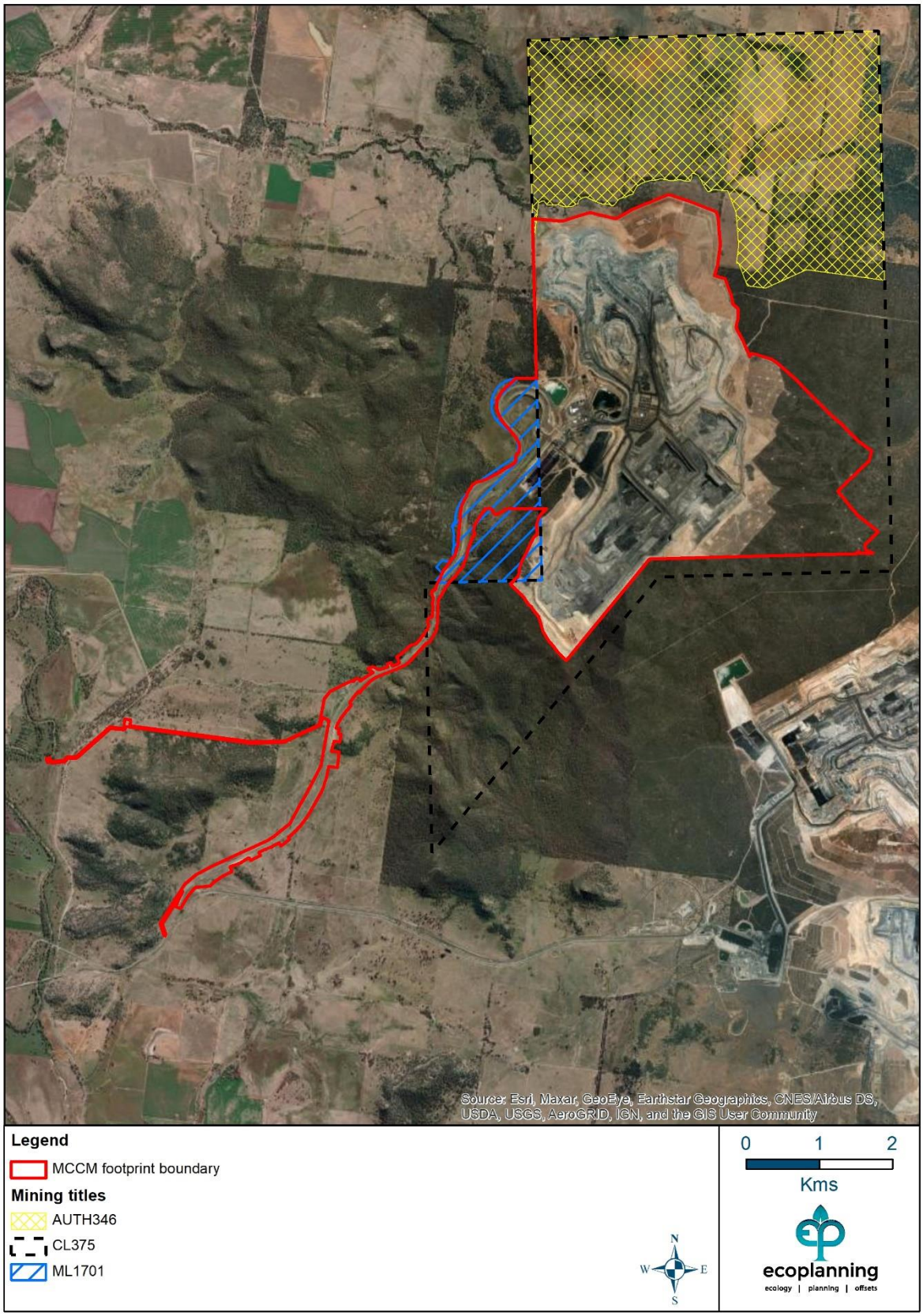

Figure 1.1: Maules Creek Coal Mine and associated mining titles.

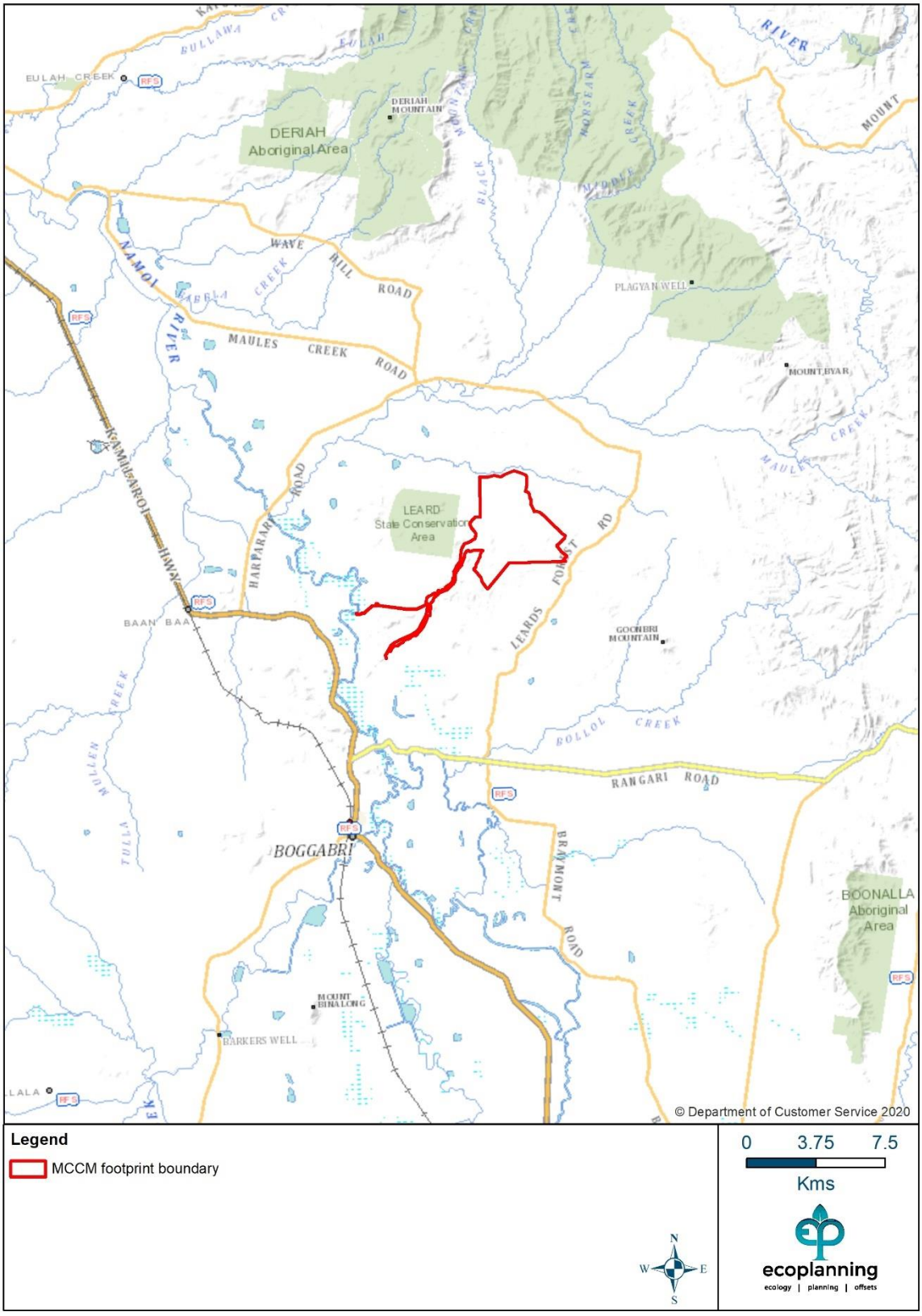

Figure 1.2: Maules Creek Coal Mine locality.

2. Methods

2.1 Literature and data review

A literature and data review was undertaken to obtain quantitative data for the impact calculations and the regional vegetation and species habitat assessment. The documents reviewed are listed below:

- Maules Creek Coal Project Environmental Assessment (Hansen Bailey 2011)
- Maules Creek Coal Project Ecological Assessment (Cumberland Ecology 2011)
- Maules Creek Coal Mine - Biodiversity Management Plan (Maules Creek Coal 2017)
- Maules Creek Coal Mine – Mining Operations Plan (Maules Creek Coal 2020)
- Maules Creek Coal Mine - Mine Site Rehabilitation Plan (Maules Creek Coal 2016)
- Threatened Biodiversity Data Collection (EES 2021) and BioNet Vegetation Classification (EES 2021) to identify PCT associations for the threatened species and possible extent of Box Gum Woodland

2.2 Impact calculations

An assessment of the amount of each MNES to be impacted was conducted as part of this assessment. The project footprint was supplied by MCC at project inception, with the clearing boundaries for years 5, 10, 15 and 21 supplied. This boundary file was used to generate all impact statistics in this DLA. As described above, MCC propose to conduct the year 15 and year 21 clearing concurrently, with all clearing completed for the project by year 15.

In addition to the proposed change to clearing sequencing, the footprint used for this DLA differs from that used in the previously approved DLA (Whitehaven Coal 2016). A track to the north-east of the project site was included in the 2016 DLA which, on review, was not included in the environmental assessment (Cumberland Ecology 2011). The track is present within historical aerial photos and, due to the fact it was not included in the environmental assessment for the project has not been considered in this DLA.

Vegetation mapping and species habitat mapping for the project footprint was also sourced from MCC. The mapping is that produced by Cumberland Ecology for the 2011 environmental assessment (Cumberland Ecology 2011).

The project footprint is shown in **Figure 2.1**, with clearing years 5, 10 and 15/21 (now to be cleared in year 15) shown. The project footprint has been analysed against the potential habitat and vegetation mapping (Cumberland Ecology 2011) within the project footprint to provide disturbance amounts for the project for each MNES. The areas disturbed within the project footprint have been compared to the maximum area approved to be cleared under EPBC 2011/5566. The impact calculations are presented in **Section 3** for each MNES. In all cases the area to be cleared for each MNES is less than the maximum disturbance limit identified in EPBC 2011/5566.

To complete the assessment GIS analysis was conducted to calculate the area of each MNES impacted within the project footprint provided. In order to calculate the area of MNES impacted the existing vegetation map produced for the project site (Cumberland Ecology 2011) was combined with the footprint provided by MCC, and the area of vegetation or habitat within the

footprint calculated. Each MNES was then associated with one or more mapped vegetation types.

Table 2.1 provides the vegetation associations for the project footprint. Note, the associations used are identical to those used for the environmental assessment prepared for the project (Cumberland Ecology 2011).

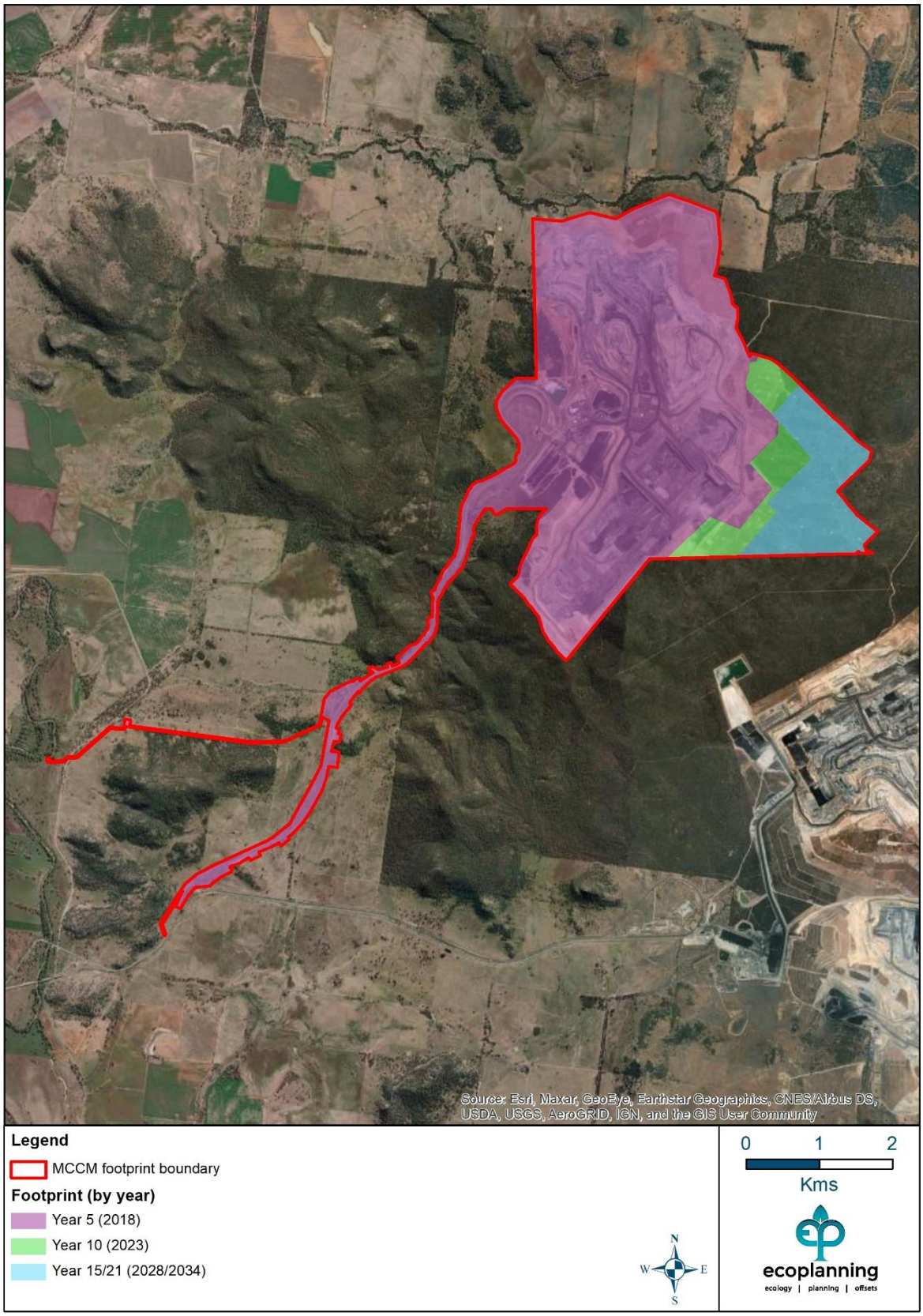

Figure 2.1: MCCM project footprint.

Table 2.1: MNES vegetation and habitat associations within the Project site.

Vegetation type and condition class	Swift Parrot	Regent Honeyeater	South-eastern Long-eared Bat	Box-Gum Grassy Woodland
Belah woodland	Y	Y	Y	
Derived Native Grassland				Y
Dwyer's Red Gum - Ironbark woodland	Y	Y	Y	
Dwyer's Red Gum woodland	Y	Y	Y	
Narrow-leaved Ironbark - White Cypress Pine shrubby open forest	Y	Y	Y	
Pilliga Box - Poplar Box - White Cypress Pine grassy open woodland	Y	Y	Y	
Silver-leaved Ironbark heathy woodland	Y	Y	Y	
White Box - Blakely's Red Gum - Melaleuca riparian forest	Y	Y	Y	Y
White Box - Narrow-leaved Ironbark - White Cypress Pine grassy open forest	Y	Y	Y	Y
White Box - Narrow-leaved Ironbark - White Cypress Pine shrubby open forest	Y	Y	Y	
White Box - Wilga - Belah woodland	Y	Y	Y	Y
Yellow Box - Blakely's Red Gum grassy woodland	Y	Y	Y	Y

2.3 Regional species habitat assessment

The available potential habitat for Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat was calculated for the Liverpool Plains (LP) IBRA subregion and the Brigalow Belt South (BBS) IBRA region. The total area of the LP IBRA subregion is approximately 941,752 ha, and is within the larger BBS IBRA region which covers approximately 5,623,054 ha.

Best available vegetation data was sourced from the SEED portal (https://www.seed.nsw.gov.au/) for the LP and BBS IBRA region. Layers sourced include three vegetation maps prepared as part of the State Vegetation Type Map, specifically:

- Border Rivers Gwydir / Namoi Region Version 2.0 (VIS 4467)
- Central West / Lachlan Region Version 1.4 (VIS 4468) and
- Western Region v1.0 (VIS 4492)

The south eastern corner of the BBS was not covered by a layer from the State Vegetation Type Map, therefore the Greater Hunter Native Vegetation Mapping v4.0 (VIS 3855) was used.

The four regional vegetation maps were combined in ArcGIS and the seamless layer clipped to the BBS IBRA region boundary. Species associations to mapped Plant Community Types (PCTs) were then made based on the data contained in the Threatened Biodiversity Data Collection (EES 2021), with each mapped vegetation community categorised either as 'habitat listed in profile' or 'not habitat'. Further assessment was then done for each species to determine which subregions within the BBS each species was likely to be found, again based on data from the Threatened Biodiversity Data Collection (EES 2021).

The area of impacted potential habitat (both for the maximum area approved to be cleared (EPBC 2011/5566) and the project footprint) was then assessed against the amount of potential habitat mapped in both the LP IBRA subregion and the BBS IBRA region.

A similar approach was adopted for mapping Box-Gum Grassy Woodland, with vegetation associations contained within the BioNet Vegetation Classification (EES 2021) used to identify those PCTs which are potentially consistent with White Box—Yellow Box—Blakely's Red Gum Grassy Woodland and Derived Native Grassland within the compilation vegetation data set. Note that, due to limitations in the vegetation mapping used, no identification of DNG was possible within the broader IBRA region or subregion.

3. Results

3.1 Disturbance limits approach

As outlined in Section 1, conditions 1 and 2 of EPBC 2011/5566 allow MCC to complete the following clearing within the project footprint:

- 544 ha of the EPBC listed White Box—Yellow Box—Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Grassy Woodland)
- 1,665 ha of habitat for the Regent Honeyeater
- 1,665 ha of habitat for the Swift Parrot
- 1,665 ha of habitat for the South-eastern Long-eared Bat (Greater Long-eared Bat)

To compare the above maximum disturbance limits to the impacts proposed within the project footprint, the footprint provided by MCC for 2018 (year 5), 2023 (year 10) and 2028/2034 (year 15/21) (including the former year 21 clearing area) was analysed against the habitat mapping available for the project footprint. **Table 3.1** provides a summary of the analysis results for each clearing period and provides the total area of clearing for each MNES in years 5, 10 and 15. The total clearing calculated is:

- Box-Gum Grassy Woodland – 539.2 ha, including 457.8 ha of woodland community and 81.4 ha of grassland community
- Regent Honeyeater – 1,556.9 ha
- Swift Parrot – 1,556.9 ha
- South-eastern Long-eared Bat – 1,556.9 ha

Typical of mining projects, proportionally more vegetation clearing occurs in earlier years than later years, with relatively small amounts of clearing in years 10, 15 and 21. For Box-Gum Grassy Woodland over 97% of clearing occurs by year 5, with a further 1.9% by year 10 and 1.0% by year 15. No clearing of Box-Gum Grassy Woodland occurs within the year 21 footprint, which is now proposed to be cleared in year 15.

Similarly, for Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat 77.8% of clearing occurs within the year 5 footprint, 8.0% by year 10 and 14.2% by year 15/21 (including the former year 21 clearing area). The total clearing of Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat potential habitat within the former year 21 footprint is 107.8 ha.

The clearing within the year 21 footprint therefore represents the lowest clearing amount for all MNES, including no impact on Box-Gum Grassy Woodland. As discussed above, it is intended that this clearing will now occur by year 15.

Table 3.1: Summary of MNES clearing, by year, for the project.

MNES	2018 (Year 5)*	2023 (Year 10)*	2028 (Year 15)*^	2034 (Year 21)*^	Total area of clearing (ha)*
Box-Gum Grassy Woodland	523.5	10.5	5.3	0	539.2
Regent Honeyeater	1,210.8	124.5	113.7	107.8	1,556.9
Swift Parrot	1,210.8	124.5	113.7	107.8	1,556.9
South-eastern Long-eared Bat	1,210.8	124.5	113.7	107.8	1,556.9

* Cannot be summed to calculate a total area of clearing as clearing overlaps in some cases.

^ The clearing to be completed in year 21 (2034) is now proposed to be completed in year 15 (2028)

A comparison of the proposed clearing against the maximum disturbance limits identified in conditions 1 and 2 of EPBC 2011/5566 was undertaken, with the results displayed in **Table 3.2**. For all MNES the total clearing calculated is less than the maximum disturbance limit set by conditions 1 and 2 of EPBC 2011/5566.

Table 3.2: Comparison of maximum disturbance limits and proposed area of clearing for MNES. **

MNES	Area of clearing in year 5, year 10 and year 15/21 from the Maules Creek Coal Mine				Maximum disturbance limit (ha)*	Difference between project footprint and max. disturbance limit (ha)*
	2018 (Year 5)*	2023 (Year 10)*	2028/2034 (Year 15/21)*^	Total area of clearing (ha)*		
Box-Gum Grassy Woodland	523.5	10.5	5.3	539.2	544	-4.8
Regent Honeyeater	1,210.8	124.5	221.5	1,556.9	1,665	-108.1
Swift Parrot	1,210.8	124.5	221.5	1,556.9	1,665	-108.1
South-eastern Long-eared Bat	1,210.8	124.5	221.5	1,556.9	1,665	-108.1

* Cannot be summed to calculate a total area of clearing as clearing overlaps in some cases.

** Rounding errors apply

^ Includes clearing formerly proposed to be undertaken in year 21 (2034).

3.2 Detailed MNES review

3.2.1 White Box-Yellow Box-Blakely's Red Gum Grassy Woodland

Literature and data review

In addition to literature cited in **Section 2.1**, the following resources were utilised in the literature and database review for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland:

- National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Department of Environment, Climate Change and Water NSW, Sydney (DECCW 2011)
- Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the List of Ecological Communities under the EPBC Act TSSC (2009)

Text is taken directly from the above sources unless noted otherwise.

Distribution, ecology and habitat

Box-Gum Grassy Woodlands and Derived Grasslands are characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees. The tree-cover is generally discontinuous and consists of widely-spaced trees of medium height in which the canopies are clearly separated (Yates & Hobbs 1997). In its pre-1750 state, this ecological community was characterised by:

- a ground layer dominated by tussock grasses;
- an overstorey dominated or co-dominated by White Box, Yellow Box or Blakely's Red Gum, or Grey Box in the Nandewar bioregion; and,
- a sparse or patchy shrub layer.

Associated, and occasionally co-dominant, trees include, but are not restricted to: Grey Box (*Eucalyptus microcarpa*), Fuzzy Box (*E. conica*), Apple Box (*E. bridgesiana*), Red Box (*E. polyanthemos*), Red Stringybark (*E. macrorhyncha*), White Cypress Pine (*Callitris glaucophylla*), Black Cypress Pine (*C. endlicheri*), Long-leaved Box (*E. goniocalyx*), New England Stringybark (*E. caliginosa*), Brittle Gum (*E. mannifera*), Candlebark (*E. rubida*), Argyle Apple (*E. cinerea*), Kurrajong (*Brachychiton populneus*) and Drooping She-oak (*Allocasuarina verticillata*). This ecological community occurs in areas where rainfall is between 400 and 1200 mm per annum, on moderate to highly fertile soils at altitudes of 170 metres to 1200 metres (NSW Scientific Committee 2002).

Grazing can also have indirect effects upon other ground layer species through soil disturbance and physical changes to the soil such as compaction, nutrient enrichment, reduced water infiltration and erosion. These changes to the soil can facilitate and maintain weed invasions and make soil conditions unsuitable for native species regeneration (Prober et al. 2002a & 2002b; Yates & Hobbs 1997). As a consequence of these pressures, there are only a small number of areas remaining that retain a highly diverse understorey dominated by native, perennial tussock grasses. These areas are extremely rare, and usually quite small in

size (Prober & Thiele 1995). They have often been cleared of trees and may no longer possess an overstorey. However, these remnants can be relatively intact despite the absence of trees.

Threats

Thiele and Prober (2000) estimated that less than 0.1% of Grassy White Box Woodlands (a component of the Box – Gum Grassy Woodland and Derived Grassland ecological community) remains in a near-intact condition. Much of the original extent of the Box – Gum Grassy Woodland and Derived Grassland ecological community has been cleared for agriculture. In most of the areas that remain, grazing and pasture-improvement have effectively removed the characteristic understorey, leaving only the overstorey trees with an understorey dominated by exotic species (McIntyre et al. 2002). In these areas, grazing has also largely prevented the regeneration of the overstorey species (Sivertsen 1993). Due to the high levels of clearing that have taken place, and continued grazing, large areas of healthy, regenerating overstorey are rare.

Regional vegetation assessment

The regional habitat assessment for Box-Gum Grassy Woodland CEEC found approximately 70,539 ha of mapped potential Box-Gum Grassy Woodland CEEC is available across the Liverpool Plains, with a total of 777,480 ha within the Brigalow Belt South IBRA region. When assessed against the project footprint the impacts equate to the equivalent of 0.07% of the potential regional extent, and 0.07% of the potential regional extent when compared to the maximum approved clearing (**Table 3.3** and **Figure 3.1**).

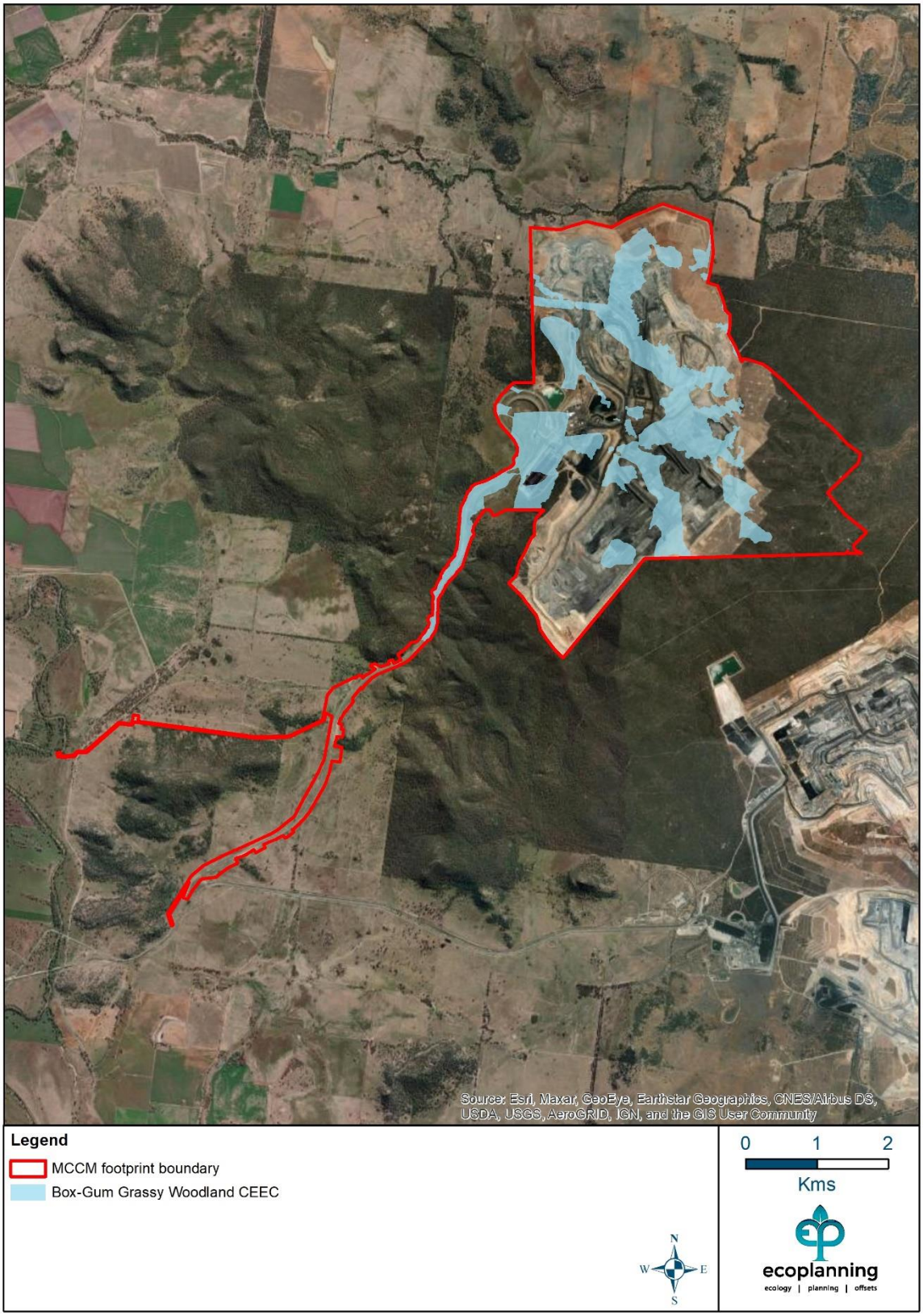

Figure 3.1: Box-Gum Grassy Woodland CEEC (Cumberland Ecology 2011).

Table 3.3: Regional assessment for Box-Gum Grassy Woodland CEEC.*

Region	Potential regional extent (ha)	Area to be cleared within the project footprint		Maximum area approved to be cleared (EPBC 2011/5566)	
		Area (ha)	Regional impact (%)	Area (ha)	Regional impact (%)
Brigalow Belt South IBRA region	777,480	539.2	0.07%	544	0.07%
Liverpool Plains IBRA subregion	70,539		0.76%		0.77%

* Rounding errors apply

Disturbance limits approach conclusion

The maximum area approved to be cleared for the project is 544 ha of Box-Gum Grassy Woodland CEEC. The project footprint is estimated to impact on 539.2 ha of Box-Gum Grassy Woodland CEEC, which is below the maximum disturbance limit by 4.8 ha.

Analysis into the amount of Box-Gum Grassy Woodland CEEC within the surrounding IBRA region found that the impact to Box-Gum Grassy Woodland CEEC is the equivalent of 0.07% of the total estimated potential extent of the CEEC.

Based on the above analysis the maximum disturbance limit for Box-Gum Grassy Woodland CEEC (544 ha) has been demonstrated to minimise impacts to the CEEC. The impact proposed (539.2 ha) is also considered to be the minimum practical during each sequence of mine clearance.

3.2.2 Regent Honeyeater

Literature and data review

In addition to literature cited in **Section 2.1**, the following resources were utilised in the literature and database review for Regent Honeyeater:

- NSW Environment, Energy and Science (EES 2021) Threatened species website. Accessed at http://www.environment.nsw.gov.au/threatenedspecies/
- EES Threatened Biodiversity Data Collection (EES 2021). Accessed at: http://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx?a=1
- Regent Honeyeater Recovery Plan 1999 – 2003. Prepared on behalf of the Regent Honeyeater Recovery Team by Peter Menkhorst, Natasha Schedvin and David Geering. Parks, Flora and Fauna Division, Victorian Department of Natural Resources and Environment (DNRE 1999).

Text below is taken directly from the above sources unless noted otherwise.

Distribution, ecology and habitat

Regent Honeyeaters occur mainly in box-ironbark open-forests and riparian stands of Casuarina on the inland slopes of the Great Dividing Range. At times significant numbers also

occur in coastal forests in NSW and eastern Victoria. Particularly when breeding, Regent Honeyeaters require access to nectar or another form of sugary plant exudate such as lerps or honeydew. A few species of Eucalyptus and a mistletoe (*Amyema cambagei*) seem to be important in providing reliable and relatively predictable nectar flows. Lack of access to these dependable nectar flows at critical times, due to clearance of the most fertile stands, the poor health of many remnants, and competition for nectar from other honeyeaters, may be a major cause of the decline of this species.

The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands.

Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. Regent Honeyeaters have been recorded in urban areas around Albury where woodlands tree species such as Mugga Ironbark and Yellow Box were planted >20 years ago.

Colour-banding of Regent Honeyeater has shown that the species can undertake large-scale nomadic movements in the order of hundreds of kilometres. However, the exact nature of these movements is still poorly understood. It is likely that movements are dependent on spatial and temporal flowering and other resource patterns.

Threats

The following threats to the recovery of this species have been identified by EES (2021):

- Historical loss, fragmentation and degradation of habitat from clearing for agricultural and residential development, particularly fertile Yellow Box-White Box-Blakely's Red Gum woodlands.
- Continuing loss of key habitat tree species and remnant woodlands from major developments (mining and agricultural), timber gathering and residential developments.
- Key habitats continue to degrade from lack of recruitment of key forage species and loss of paddock trees and small remnants increasingly fragmenting the available habitat
- Suppression of natural regeneration of overstorey tree species and shrub species from overgrazing. Riparian gallery forests have been particularly impacted by overgrazing.
- Competition from larger aggressive honeyeaters, particularly Noisy Miners, Noisy Friarbirds and Red Wattlebirds.
- The small population size and restricted habitat availability make the species highly vulnerable to extinction via stochastic processes and loss of genetic diversity, and reduced ability to compete and increased predation and reduced fledging rates.
- Egg and nest predation by native birds and mammals

- Inappropriate forestry management practices that remove large mature resource-abundant trees. Firewood collection and harvesting in Box-Ironbark woodlands can also remove important habitat components.
- Disturbance at nesting sites leading to reduced nesting success by recreational users.
- Loss of key foraging resources as a result of inappropriate fire regimes.
- Drought has limited the availability of free-standing water, which is considered a key component of an optimal nesting site.

Regional vegetation and species habitat assessment

The regional habitat assessment for Regent Honeyeater found that approximately 126,019 ha of potential habitat is available across the Liverpool Plains, and a total of 552,444 ha of potential habitat is mapped within the Brigalow Belt South IBRA region. When assessed against the project footprint the impacts equate to the equivalent of 0.28% of the regional potential habitat mapped for the Regent Honeyeater, and 0.30% of the potential habitat mapped when compared to the maximum approved clearing (**Table 3.4** and **Figure 3.2**).

Table 3.4: Regional habitat assessment for Regent Honeyeater.*

Region	Potential regional habitat (ha)	Area to be cleared within the project footprint		Maximum area approved to be cleared (EPBC 2011/5566)	
		Area (ha)	Regional impact (%)	Area (ha)	Regional impact (%)
Brigalow Belt South IBRA region	552,444	1,556.9	0.28%	1,665	0.30%
Liverpool Plains IBRA subregion	126,019		1.24%		1.32%

* Rounding errors apply

Disturbance limits approach conclusion

The maximum area of Regent Honeyeater potential habitat approved to be cleared for the project is 1,665 ha. The project footprint is estimated to impact on 1,556.9 ha of Regent Honeyeater potential habitat, 108.1 ha less than the maximum disturbance limit.

Analysis into the amount of Regent Honeyeater potential habitat within the surrounding IBRA region found that the impact to the available potential habitat is the equivalent of 0.28% of the total potential habitat.

Based on the above analysis the maximum disturbance limit for Regent Honeyeater potential habitat (1,665 ha) has been demonstrated to minimise impacts to the species. The impacts proposed (1,556.9 ha) are also considered to be the minimum practical during each sequence of mine clearance.

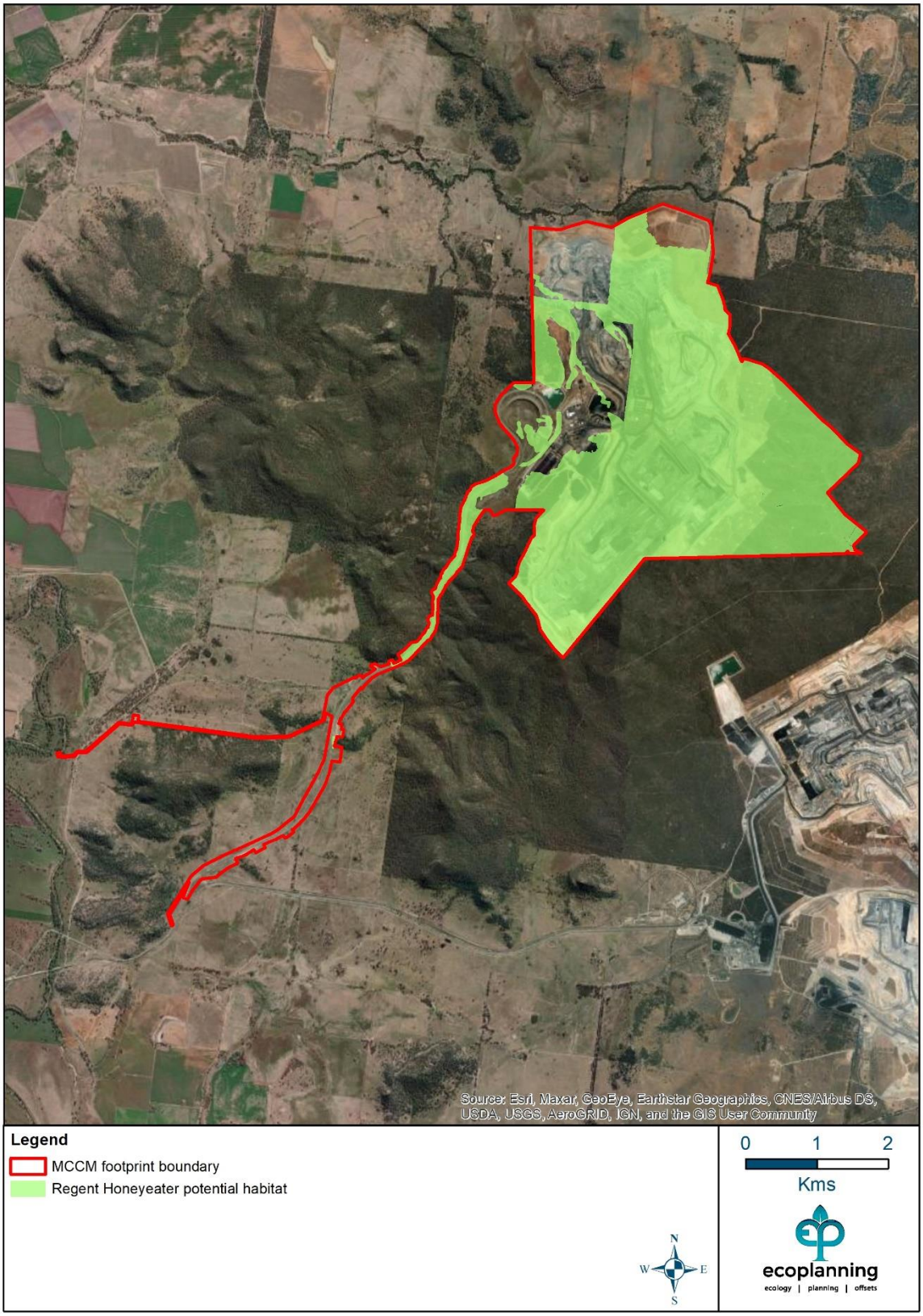

Figure 3.2: Regent Honeyeater potential habitat (Cumberland Ecology 2011).

3.2.3 Swift Parrot

Literature and data review

In addition to literature cited in **Section 2.1**, the following resources were utilised in the literature and database review for Swift Parrot:

- NSW Environment, Energy and Science (EES 2021) Threatened species website. Accessed at http://www.environment.nsw.gov.au/threatenedspecies/
- EES Threatened Biodiversity Data Collection. Accessed at: http://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx?a=1
- Swift Parrot Recovery Plan. Department of Primary Industries, Water and Environment, Hobart. Swift Parrot Recovery Team (2001).

Text below is taken directly from the above sources unless noted otherwise.

Distribution, ecology and habitat

The Swift Parrot breeds only in Tasmania and migrates to mainland Australia between March and October. During winter it is semi-nomadic, foraging for lerps and nectar in flowering eucalypts predominantly in Victoria and New South Wales, particularly in box ironbark forests and woodlands. In Tasmania, the breeding range of the Swift Parrot is largely restricted to the east coast within the range of the Tasmanian blue gum.

In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Commonly used lerp infested trees include Inland Grey Box (*E. microcarpa*), Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*). They return to some foraging sites on a cyclic basis depending on food availability.

Following winter, they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum (*Eucalyptus globulus*). The breeding season of the Swift Parrot coincides with the flowering of blue gum and the nectar of this eucalypt is the main source of food for the parrots during breeding.

Threats

Woodlands and forests within the parrot's over-wintering range and its restricted breeding distribution have been fragmented and substantially reduced by land clearance for agriculture and urban and coastal development. Forestry operations and firewood collection have also altered the age structure of forests, resulting in the loss of older trees that provide a major food resource as well as hollows for nesting. The swift parrot also suffers from high mortality during the breeding season through collisions with man-made structures such as windows, wire mesh fences and vehicles.

The following threats to the recovery of this species have been identified by EES (2021):

- Habitat loss and degradation.
- Changes in spatial and temporal distribution of habitat due to climate change.
- Reduction in food resources due to drought.
- Competition for food resources.
- Collision mortality.
- Psittacine Beak and Feather Disease (PBFD).
- Infestation by invasive weeds.
- Inappropriate fire regimes.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Predation by cats.
- Illegal capture and trade of wild birds for aviculture.

Regional vegetation and species habitat assessment

The regional habitat assessment for Swift Parrot found approximately 146,204 ha of potential habitat is available across the Liverpool Plains, and a total of 1,655,017 ha of potential habitat is mapped within the Brigalow Belt South IBRA region. When assessed against the project footprint the impacts equate to the equivalent of 0.09% of the regional potential habitat mapped for the Swift Parrot, and 0.10% of the potential habitat mapped when compared to the maximum approved clearing (**Table 3.5** and **Figure 3.3**).

Table 3.5: Regional habitat assessment for Swift Parrot.*

Region	Potential regional habitat (ha)	Area to be cleared within the project footprint		Maximum area approved to be cleared (EPBC 2011/5566)	
		Area (ha)	Regional impact (%)	Area (ha)	Regional impact (%)
Brigalow Belt South IBRA region	1,655,017	1,556.9	0.09%	1,665	0.10%
Liverpool Plains IBRA subregion	146,204		1.06%		1.14%

* Rounding errors apply

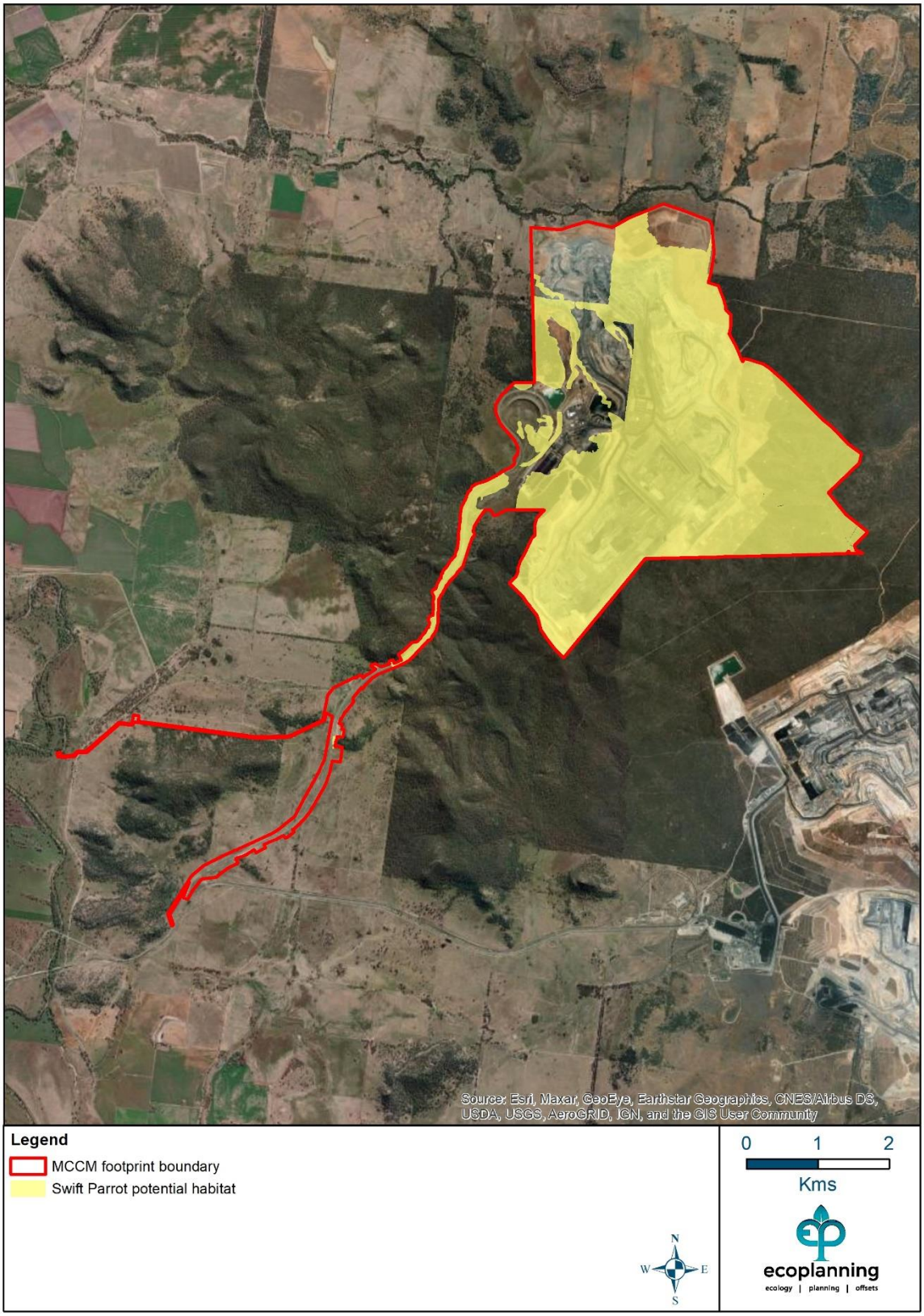

Figure 3.3: Swift Parrot potential habitat (Cumberland Ecology 2011).

Disturbance limits approach conclusion

The maximum area of Swift Parrot potential habitat approved to be cleared for the project is 1,665 ha. The project footprint is estimated to impact on 1,556.9 ha of Swift Parrot potential habitat, 108.1 ha less than the maximum disturbance limit.

Analysis into the amount of Swift Parrot potential habitat within the surrounding IBRA region found that the impact to the available potential habitat is the equivalent of 0.09% of the total potential habitat.

Based on the above analysis the maximum disturbance limit for Swift Parrot potential habitat (1,665 ha) has been demonstrated to minimise impacts to the species. The impacts proposed (1,556.9 ha) are also considered to be the minimum practical during each sequence of mine clearance.

3.2.4 South-eastern (South-eastern) Long-eared Bat

Until recently the south-eastern long-eared bat was included as a distinct form of the Greater Long-eared bat (*Nyctophilus timoriensis*) complex and was listed as such under the EPBC Act. In 2009 it was formally described as a separate species, *Nyctophilus corbeni* (Corben's or South-eastern Long-eared Bat), by Parnaby (2009). There are no recognised subspecies (Woinarski et al. 2014). The approvals for Maules Creek Coal Mine refer to Greater Long-eared Bat (*N. corbeni*), and this document uses the current nomenclature and refers to the south eastern form of the Greater Long-eared Bat, *N. corbeni*, or South-eastern Long-eared Bat.

Literature and data review

In addition to literature cited in Section 2.1, the following resources were utilised in the literature and database review for Southern Long-eared Bat:

- NSW Environment, Energy and Science (EES 2021) Threatened species website. Accessed at https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10568
- EES Threatened Biodiversity Data Collection. Accessed at: http://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx?a=1
- *Nyctophilus corbeni* (south-eastern long-eared bat) conservation advice, approved on 01/10/2015 by the Commonwealth TSSC. Accessed at: https://www.environment.gov.au/biodiversity/threatened/species/pubs/83395-conservation_advice-01102015.pdf

Text below is taken directly from the above sources unless noted otherwise.

Distribution, ecology and habitat

The South-eastern Long-eared bat is found in southern central Queensland, central western New South Wales, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin (Duncan et al., 1999; Turbill and Ellis 2006), with the Pilliga Scrub region being the distinct stronghold for the species (DPIE 2021). Most records are from inland of the Great Dividing Range (Parnaby 2009). The species is uncommon within this distribution and is rarely recorded (DoE 2013), except in some areas including the Nandewar and BBS bioregions in NSW and QLD. The species occurs in a number of national parks (NP) and nature reserves (NR) across its range.

The South-eastern Long-eared Bat is found in a wide range of inland woodland vegetation types. These include Box / Ironbark / Cypress Pine woodlands, Buloke woodlands, Brigalow woodland, Belah woodland, Smooth-barked Apple woodland, River Red Gum forest, Black Box woodland, and various types of tree mallee (Duncan et al., 1999; Schulz and Lumsden 2010; Woinarski et al., 2014). The species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches (Turbill and Ellis 2006), suggesting its home range is probably large (Lumsden et al., 2008). It appears that old-growth vegetation is a critical habitat component in the Victorian distribution (Lumsden et al., 2008). The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer (Turbill and Ellis 2006).

The South-eastern Long-eared Bat is an insectivorous bat that hunts by taking flying prey or by foliage-gleaning in flight or by foraging on the ground (Lumsden and Bennett 2000; Schulz and Lumsden 2010). When hunting in flight it generally consumes beetles, bugs and moths (Lumsden and Bennett 2000), however it has also been recorded feeding on grasshoppers and crickets (Department of the Environment 2013). Foraging appears to be concentrated around patches of trees in the landscape, with many individuals from different species of bat sharing the same foraging area (Department of the Environment 2013).

Studies have found that the south-eastern long-eared bat roosts solitarily, mainly in dead trees or dead spouts of live trees. In studies of roosting behaviour in Victoria most bats were found roosting individually in mallee eucalypts in areas of long-unburnt mallee, with some under bark or in fissures of dead Buloke (*Allocasuarina luehmannii*) or Belah (*Casuarina cristata*) trees (Lumsden et al., 2008). A study in New South Wales found maternity colonies, consisting of 10-20 individuals, roosting in dead trees including Ironbarks, Cypress and Buloke (Schulz and Lumsden 2010). It appears that most roost sites are used just for a single day and large distances are travelled at night, with consecutive roost sites generally within four km (Lumsden et al., 2008).

Threats

Due to the lack of data available to assess the population decline of the South-eastern Long-eared Bat, providing a detailed assessment of the current threats to the survival of this species is difficult. However it is likely that area of occupancy is declining due to habitat loss, particularly in NSW and QLD, and to habitat degradation associated with altered fire regimes, timber extraction, mining and other factors (Woinarski et al., 2014). Habitat loss and fragmentation are considered here as known threats, with potential threats discussed following these known threats.

Regional vegetation and species habitat assessment

The regional habitat assessment for South-eastern Long-eared Bat found that approximately 172,005 ha of potential habitat is available across the Liverpool Plains, and a total of 1,912,021 ha of potential habitat is mapped within the Brigalow Belt South IBRA region. When assessed against the project footprint the impacts equate to the equivalent of 0.08% of the regional potential habitat mapped for the South-eastern Long-eared Bat, and 0.09% of the potential habitat mapped when compared to the maximum approved clearing (**Table 3.6** and **Figure 3.4**).

Table 3.6: Regional habitat assessment for South-eastern Long-eared Bat.*

Region	Potential regional habitat (ha)	Area to be cleared within the project footprint		Maximum area approved to be cleared (EPBC 2011/5566)	
		Area (ha)	Regional impact (%)	Area (ha)	Regional impact (%)
Brigalow Belt South IBRA region	1,912,021	1,556.9	0.08%	1,665	0.09%
Liverpool Plains IBRA subregion	172,005		0.91%		0.97%

* Rounding errors apply

Disturbance limits approach conclusion

The maximum area of South-eastern Long-eared Bat potential habitat approved to be cleared for the project is 1,665 ha. The project footprint is estimated to impact on 1,556.9 ha of South-eastern Long-eared Bat potential habitat, 108.1 ha less than the maximum disturbance limit.

Analysis into the amount of South-eastern Long-eared Bat potential habitat within the surrounding IBRA region found that the impact to the available habitat is the equivalent of 0.08% of the total potential habitat.

Based on the above analysis the maximum disturbance limit for South-eastern Long-eared Bat potential habitat (1,665 ha) has been demonstrated to minimise impacts to the species. The impacts proposed (1,556.9 ha) are also considered to be the minimum practical during each sequence of mine clearance.

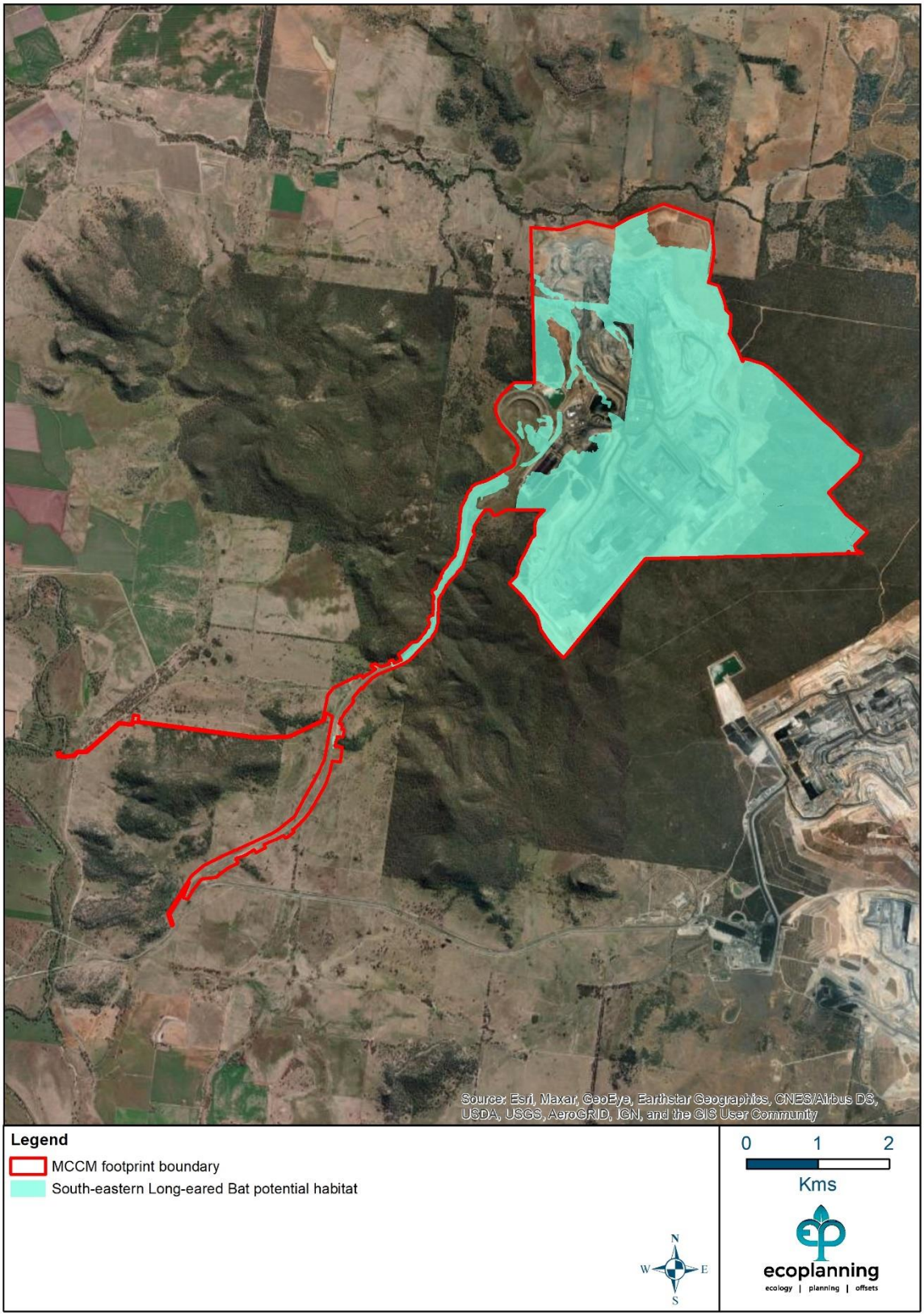

Figure 3.4: South-eastern Long-eared Bat potential habitat (Cumberland Ecology 2011).

4. Conclusion

The analysis completed for this report included an assessment of the proposed impacts to a number of MNES compared to the disturbance approved. A review of the potential habitat and/or extent of each MNES within both Liverpool Plains subregion and Brigalow Belt South region was also completed, with the area proposed to be cleared compared to these figures.

The analysis found the proposed clearing for each MNES is less than the maximum disturbance limit authorised by conditions 1 and 2 of EPBC 2011/5566. The analysis also found that the clearing proposed represents a small proportion of the potential threatened species habitat or CEEC extent in the Brigalow Belt South IBRA region and Liverpool Plains IBRA subregion.

The clearing previously identified to occur in year 21 is proposed to be conducted by year 15. The assessment has shown that the level of clearing previously planned to be completed by year 21 is relatively minor, with no impacts to Box-Gum Grassy Woodland to occur after year 15. For Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat total impacts for year 21 represent only 6.9% (or 107.8 ha) of the total clearing. The completion of this clearing earlier than previously planned is considered suitable and acceptable, incorporates increased understanding of the deposit within the project area and further mine planning and the clearing conducted remains within the maximum disturbance limits for all MNES assessed.

Based on the analysis completed, the progressive rehabilitation planned for the mine and the amount of MNES habitat in the surrounding region the maximum disturbance limit for each MNES has been demonstrated to minimise impacts to the potential habitat or extent of each MNES assessed.

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Appendix A: Independent ecological expert confirmation

Australian Government
Department of Agriculture, Water and the Environment

Ref: 2010/5566
2011/5923

Mr Scott Mitchell
Group Environment Superintendent
Whitehaven Coal Limited
231 Conadilly St
Gunnedah NSW 2380

Approval of independent ecological experts – Maules Creek Coal Mine (EPBC 2010/5566) and Tarrawonga Coal Mine (EPBC 2011/5923)

Dear Mr Mitchell

Thank you for your email of 16 June 2021, requesting approval of suitably qualified independent ecological experts to conduct analyses of the proposed revised disturbance limits approaches of EPBC Act approval 2010/5566-Maules Creek Coal Mine and EPBC Act approval 2011/5923-Tarrawonga Coal mine, in accordance with their specified EPBC approval conditions.

I have noted the information provided, including the qualifications and experience of the nominated ecologists and the general requirements for experts in relation to *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approvals.

As delegate of the Minister, I have approved:

- Lucas McKinnon (Ecoplanning) for conducting analyses of the proposed revised disturbance limits approaches of Maules Creek Coal Mine and Tarrawonga Coal mine, in accordance with their specified EPBC approval conditions; and
- Darren James (DAJenvironmental) for conducting analyses of the proposed revised disturbance limits approaches of Maules Creek Coal Mine and Tarrawonga Coal mine, in accordance with their specified EPBC approval conditions.

Should you require any further information please contact Robin Nielsen, Assistant Director, Post Approvals Section, on 02 6274 1004 or by email: post.approvals@awe.gov.au.

Yours sincerely

Dwaine McMaugh
Director Post Approvals
Assessments (Vic, Tas) and Post Approvals Branch

19 July 2021

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