

Draft Offset Management Plan Offset Site 1: Pineapple Farm

EPBC 2018/8340

Prepared for:

Karreman Quarries Pty Ltd

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PREPARED BY	Selina Carruthers
REVIEWED BY	Jeromy Claridge

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			Name/Position	Signature
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Prepared for:

Karreman Quarries Pty Ltd

Prepared by:

Attexo Group Pty Ltd

attexo.com.au

ABN 75 637 138 008

Attexo Group Pty Ltd 2021

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1.0 Introduction

1.1 Purpose

In December 2018 a referral (EPBC 2018/8340) for the West Mount Cotton Quarry Extension Project (the Project) was submitted to the Commonwealth Department of Environment and Energy (DoEE), now Department of Agriculture, Water and the Environment (DAWE), which assessed the potential for significant impacts on matters of national environmental significance (MNES). The Project was subsequently declared a controlled action under the EPBC Act for its potential to have a significant impact on Threatened Ecological Communities, and threatened flora and fauna.

This Draft Offset Management Plan (OMP) has been prepared for the West Mount Cotton Quarry Extension Project (EPBC 2018/8340, the Project). This Draft Offset Management Plan OMP has been prepared to address offset requirements set out in the Environment Protection and Biodiversity Act 1999 (EPBC Act) Environmental Offsets Policy (DSEWPC 2012).

This OMP identifies the proposed offset site and environmental gains that will be achieved by the proposed offset, and on that basis demonstrates that the proposed offset will be adequate to compensate for the Project's environmental impacts. This OMP relates only to Offset Site 1 of the Preliminary Documentation (PD) and is separate from OMPs prepared for Offset Site 2 and 3.

1.2 Project description

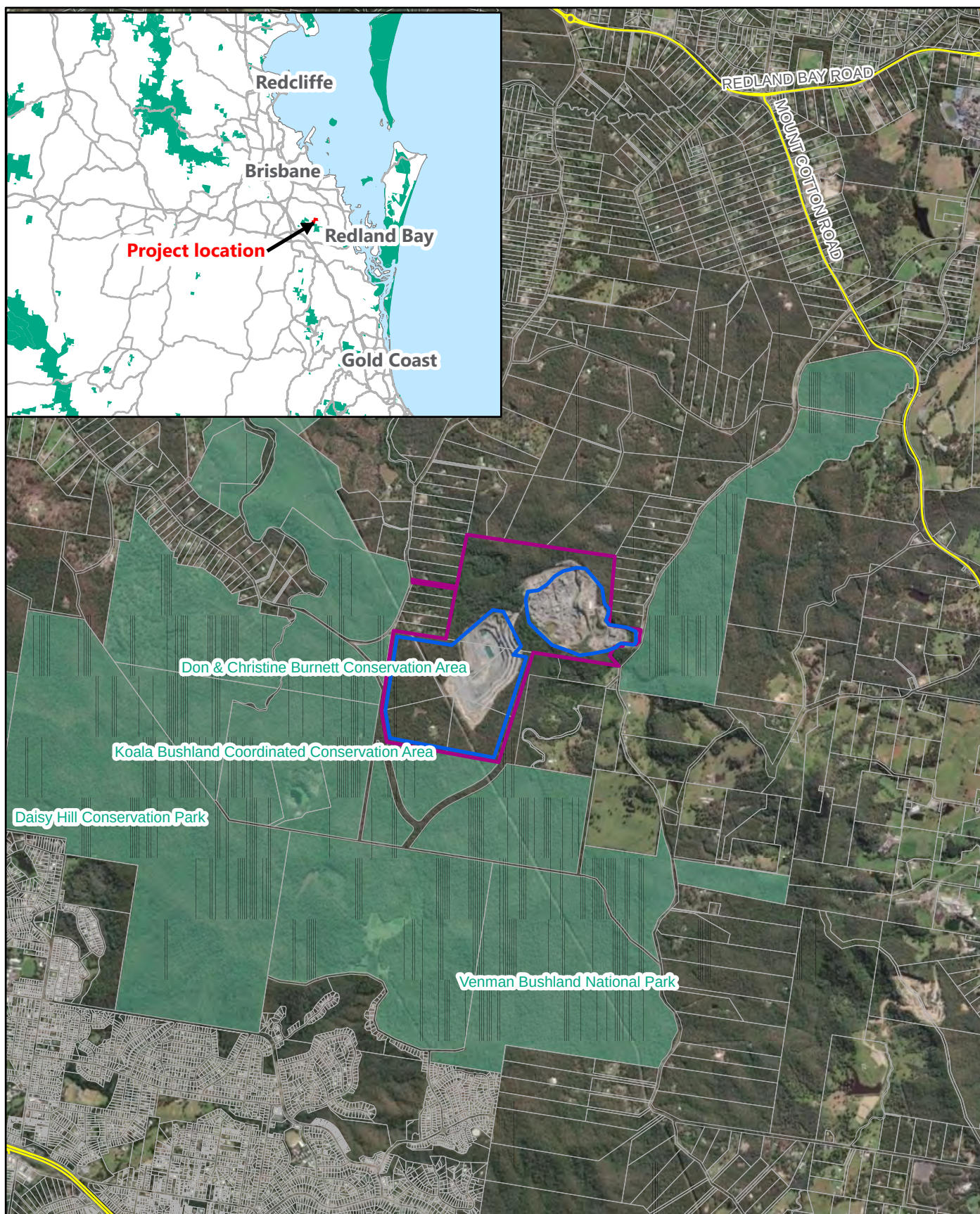
Karreman Quarries Pty Ltd (the proponent) are seeking approval to extend the existing quarry pit of the West Mount Cotton Quarry located on West Mount Cotton Road in Redland City, Queensland. The Project is located within the West Mount Cotton Key Resource Area (KRA) – KRA72, see **Figure 1.1**.

The Impact Area (the area in which the proposed action will take place) associated with the Project is 51.52 ha, including 48.3 ha of regrowth and remnant vegetation, with the remaining areas non-remnant.

The Project has undergone design refinement since it was initially referred, and the current Impact Area represents a reduction in the total impacted remnant and regrowth vegetation of 10.49 ha. Recent changes to the proposed layout have principally revolved around decreasing the footprint in proximity to nearby conservation areas. The Impact Area is shown on **Figure 1.1**.

1.3 Offset site

The Project's offset liabilities are proposed to be offset using three properties, however, this OMP relates only to one property, Offset Site 1: Pineapple Farm (the offset site). This offset is located 1 km north-west of the Project, see **Figure 1.2**. The site is owned by the Proponent and encompasses 48.81 ha and will be secured as a direct offset to acquit the Project's offset obligations. Further detail on how the offset site addresses requirements set out in the *EPBC Act Environmental Offsets Policy Principles* are provided in **Section 6.5**.



Source: Attexo (2021), DNRME (2021),



Legend

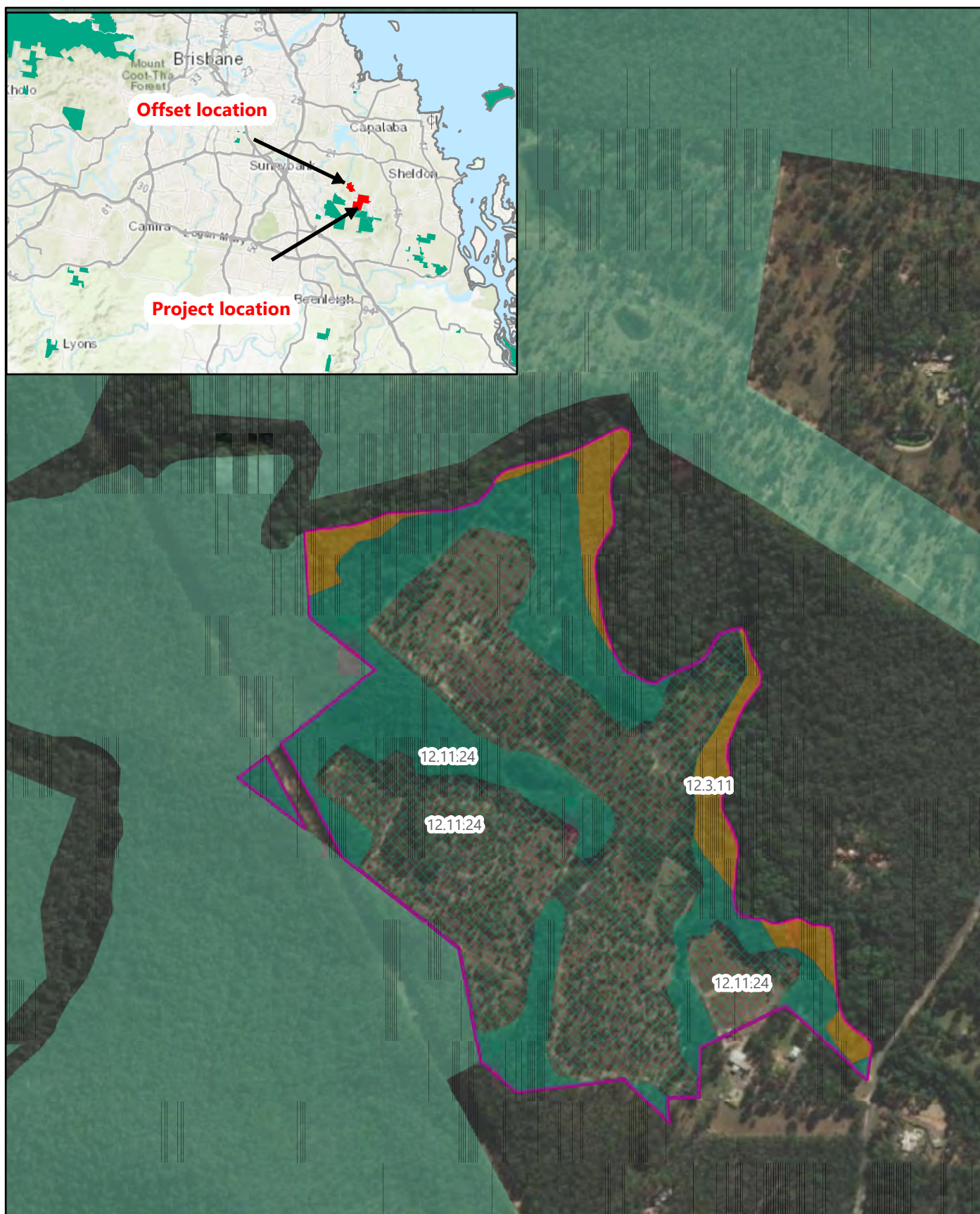
- Key Resource Area
- Study area
- Roads
- Main Roads
- Protected_areas

Project Location

Karremman Quarries Pty Ltd
Mount Cotton Quarry
Figure 1.1

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

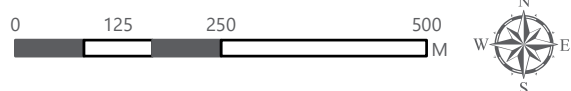
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Source: Attexo (2021), DNRME (2021),

Legend

VM_STATUS	non-rem_lc
rem_end	Offset boundary
rem_oc	Protected_areas
rem_leastc	
non-rem_end	
non-rem_oc	



Offset Site 1 - Pineapple Farm

Karremman Quarries Pty Ltd
Mount Cotton Quarry
Figure 1.2

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance

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1.4 Impact and offset summary

Table 1.1 provides values from the Offsets Assessment Guide Calculator (the Guide) for each of the MNES to be offset. The Guide supports the *EPBC Act Environmental Offsets Policy*, using a balance sheet approach to calculate the offsets required to adequately compensate for unavoidable impacts to threatened species and ecological communities.

Table 1.1 Offsets Assessment Guide Calculator for MNES

Quantum of impact	Time horizon (years) and Time until ecological benefit (years)	Start Area (ha) and Quality (scale of 0-10)	Future Area and Quality without Offset	Future Area and Quality with Offset	Raw Gain	Confidence in Result (%)	Adjusted Gain	Net Present Value	% of Impact Offset	
Koala (foraging and breeding habitat)										
51.52 ha	20	48.81	47.4	48.81	1.37	95%	1.30	1.25	8.75	24.26%
	20	6	6	8	2.00	85%	1.70	1.63		
Grey-headed Flying-fox (winter and spring foraging habitat)										
48.30 ha	20	48.81	47.4	48.81	1.37	95%	1.30	1.25	10.7	27.68%
	20	6	6	9	3.00	70%	2.10	2.02		
Greater Glider (foraging and breeding habitat)										
48.30 ha	20	48.81	47.4	48.81	1.37	95%	1.30	1.25	4.85	20.09%
	20	5	5	6	1.00	90%	0.90	0.86		



2.0 Conservation advice and other relevant documents

2.1 Relevant conservation advice

Relevant Conservation Advice, Recovery Plans and Threat Abatement Plans are summarised in **Table 2.1**.

Table 2.1 Relevant documentation addressed in this OMP

Document Name	Where and how the Plan addresses the document
Approved Conservation Advice: Koala (<i>Phascolarctos cinereus</i>) (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Koala Northern Design Table Unit) (DSEWPC 2012)	This conservation advice identifies key threats and threat abatement, and priority management actions for improving the status, health and sustainability of the combined population of Koala. Key threats and priority recovery and threat abatement actions include: • Habitat Loss, Disturbance and Modification: Developing and implementing planning, management and monitoring protocols to prevent loss of important habitat, koala populations or connectivity options. • Animal Predation: Develop and implement management to control predation of Koalas by dogs. • Conservation information: Engage with private landholders and land managers to contribute to conservation actions for the Koala. The proposed offset site has been selected as it provides an opportunity to improve connectivity between isolated patches of remnant vegetation, along the Tingalpa and Buhot Creek riparian corridor and Don and Christine Burnett Conservation Area which is located immediately southwest of the site. Management actions and monitoring activities proposed by this OMP will reduce the threat habitat loss and dog attack and engage with the private landholder/land manager. Specifically, the establishment of the offset will help ensure that any currently legal vegetation (including regrowth) clearing, thinning and timber harvesting within the offset area is prohibited. Offset site management will engage closely with the landholder to contribute to conservation actions for the Koala. The offset site management actions (Section 9.0) include restriction of access to unauthorised personnel (Section 9.3), fencing and incorporation within existing established dog-proof fencing for the property/cooperative initiatives (Section 9.3), pest animal and Koala mortality monitoring (Section 10.1), and where, trigger criteria are exceeded, pest animal control actions (Section 9.7). They also include bushfire management actions (Section 9.5.5) which will help reduce the risk of catastrophic fire causing habitat loss, disturbance and modification (as well as Koala injury and mortality).
EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DoE 2014)	The guidelines determine if a proposed action will have a significant impact on the koala. Key threats relevant to the offset (dog attack, vehicle strike, disease, habitat loss) and highly effective mitigation actions for each are also provided in the guideline and summarised below: • Dog-proof and koala-proof fencing; • Dog control strategy; • Signage and education; • Biosecurity and hygiene procedures for <i>Phytophthora cinnamomi</i> and Myrtle Rust. Management actions and monitoring activities proposed by this OMP will specifically reduce the threat of dog attack and habitat loss. Specifically, the establishment of the offset will help ensure that currently legal vegetation (including regrowth) clearing, thinning and timber harvesting is prohibited. Offset site management will engage closely with the landholder to contribute to conservation actions for the Koala. The offset site management actions (Section 9.0) include restriction of access to unauthorised personnel (Section 9.2), fencing and incorporation within established dog-proof fencing for the property/cooperative initiatives (Section 9.3), pest animal and Koala mortality monitoring (Section 10.1), and where, trigger criteria are exceeded, pest animal control actions

Document Name	Where and how the Plan addresses the document
National Recovery Plan for the Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) (DAWE 2021)	(Section 9.7). They also include bushfire management actions (Section 9.5.5) which will help reduce the risk of catastrophic fire causing habitat loss, disturbance and modification (as well as Koala injury and mortality). The purpose of this plan is to set out the management and research actions necessary to stop the decline of and support the recovery of the species over the next 10 years. The necessary actions for the recovery of the species include: • Verify and spatially identify key foraging areas and vegetation communities used through an annual cycle; • Increase the extent and viability of foraging habitat that is productive during winter and spring; • Protect and increase native roosting habitat critical to the survival of the species; • Promote the use of plain wire fencing instead of barbed wire to reduce entanglement; • Engage with the community to build their capacity to coexist with the species; • Identify existing flying-fox roosting habitat, opportunities for creating or rehabilitating habitat away from people and areas unsuitable for development due to potential conflict. The offset site has been selected on the basis that forest red gum (<i>Eucalyptus tereticornis</i>) is a dominant canopy species in the site. Vegetation communities that contain forest red gum are recognised (among others) as an important winter and foraging resource for grey-headed flying-fox (DAWE 2021). Therefore, all management actions and monitoring activities detailed in Section 9.0 will increase the extent and viability of winter and spring foraging habitat. Specific actions have also been identified in Section 9.3 which will promote the use of plain wire fencing instead of barbed wire to reduce risk of entanglement. This includes liaising with the landholder to use plain wire as the 'top wire(s)' on offset fences wherever this is able to be accommodated within the context of the overall property livestock and pest animal (including wild dog) fencing.
Approved Conservation Advice: Greater glider (<i>Petauroides volans</i>) (TSSC 2016)	This Conservation Advice identifies key threats (habitat loss through clearing, clear-fell logging and the destruction of senescent trees due to prescribed burning, habitat fragmentation, too intense or frequent fires and timber production), conservation priorities and management actions of the squatter pigeon (southern). Key threats and priority recovery and threat abatement actions include: • Reduce the frequency and intensity of prescribed burns; • Identify appropriate levels of patch retention, habitat tree retention, and logging rotation in hardwood production; • Protect and retain hollow-bearing trees, suitable habitat and habitat connectivity. The proposed offset site has been selected on the basis it provides an opportunity to improve connectivity between isolated patches of remnant vegetation, along the Tingalpa and Burhot riparian corridors and Don and Christine Burnett Conservation Area which is located immediately to the southwest of the site. The establishment of the offset will also help ensure that any currently legal vegetation (including regrowth) clearing, thinning and timber harvesting within the offset area is prohibited. Management actions and monitoring activities proposed by this OMP reduce threats of habitat loss and inappropriate fire regimes. Specifically, management actions (Section 9.0) include fencing (Section 9.3), access restriction to unauthorised personnel and clearing (Section 9.2), fire and fuel control methods in accordance with the REDD fire management guidelines (Section 9.5.5) and maintenance and monitoring (Section 12.0).

2.2 Other key documents

Other key documents that are important to understanding and evaluating the OMP but do not have statutory force under the EPBC Act are summarised in **Table 2.2**.

Table 2.2 Other key documents addressed in this OMP

Document Name	Where and how the Plan addresses the document
<i>Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 – 2016 (EPA 2006)</i>	The plan is subordinate Queensland legislation created under the <i>Nature Conservation Act 2002</i>, whilst the management program is policy document outline the legislative and policy context for the conservation of Koala in Queensland. Management approaches outlined in both include: • Habitat protection from vegetation clearing; • Reduce vehicle and domestic dog related koala mortality; • Translocation; • Research and monitoring; • Education and community awareness. Management actions and monitoring activities proposed by this OMP are based on this conservation plan and management program to protect koala habitat and reduce threats. Specifically, management actions (Section 9.0) include fence and access restriction to unauthorised personnel, dog-proof fencing, pest animal control actions and annual maintenance and monitoring. Management and monitoring follow an adaptive management approach so that effectiveness of actions is assessed and there is continual improvement (Section 9.1).
Guide to Determining Terrestrial Habitat Quality Version 1.2 (the Guide) (DEHP 2017)	This guide provides approved methodology for determining habitat quality for land-based offsets under the Queensland Environmental Offsets Framework. The key indicators for determining habitat quality of a land-based impact site or an offset site are: • Site condition – a general condition assessment of vegetation compared to the benchmark; • Site context – an analysis of the site in relation to the surrounding environment; • Species habitat index – the ability of the site to support a species. Targeted surveys and monitoring surveys documented in this OMP have incorporated this approved methodology to assess MNES and habitat in the offset site (Sections 3.0 and 10.1).
Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland Version 5.1 (Neldner et al. 2020)	The manual provides and describes the following: • Specific procedures for regional ecosystem and vegetation survey and mapping; • General guidelines for carrying out similar mapping; • The classification of vegetation and regional ecosystems; • Collection of site data. Surveys documented in this OMP have incorporated this approved methodology to assess habitat in the offset site (Section 3.0 and 10.1).
Queensland BioCondition Assessment Manual Version 2.2 (BioCondition) (Eyre et al. 2015)	BioCondition is a condition assessment framework for Queensland and measures how well a terrestrial ecosystem is functioning for biodiversity values. BioCondition provides a numeric score for overall site condition when assessed against relevant BioCondition benchmark. BioCondition assesses the following: • Site-based attributes; • Landscape-scale attributes – fragmented or intact landscapes.

Document Name	Where and how the Plan addresses the document
	Surveys documented in this OMP have incorporated this approved methodology to assess habitat in the offset site (Section 3.0 and 10.1).
Survey Guidelines for Australia's threatened mammals (McElroy et al. 2004)	The guidelines provide approved methodology for the detection and determining the presence of Australian threatened mammal species. Targeted surveys and monitoring surveys documented in this OMP have incorporated this approved methodology to assess MNES mammal species and habitat in the offset site (Section 3.0 and 10.1).
Queensland Terrestrial Vertebrate Fauna Survey Guidelines Version 3.0 (Eyre et al. 2018)	The guidelines provide approved methodology for generic and targeted fauna survey methods, factors affecting surveys, data management and handling fauna. Targeted surveys and monitoring surveys documented in this OMP have incorporated this approved methodology to assess MNES fauna species and habitat in the offset site (Section 3.0 and 10.1).
A field manual for surveying and mapping nationally significant weeds (McNaught et al. 2006)	This manual provides approved methodology for standardised, systematic weed assessment procedures that can be applied across all land tenures. Baseline surveys documented in this OMP have incorporated this approved methodology to assess the presence of declared (restricted and prohibited), high threat (Koala) and Weeds of National Significance (WoNS) within the offset site (Section 3.0 and 10.1).
Monitoring Techniques for Vertebrate Pests (Feral pigs; Feral cats; Wild dogs; Foxes; Rabbits) (Mitchell and Balogh 2007)	The purpose of this manual is to provide details of the techniques available to standardise the monitoring methods of feral pigs and cats, wild dogs, foxes and rabbits in Australia. Pest animal monitoring documented in this OMP has, where relevant, incorporated described methods to assess the presence of vertebrate pests species within the offset site (Section 3.0 and 10.1).
Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act (the Guide) (Maseyk et al. 2017)	Evaluation of risk of loss to MNES described in this report is based on the described methodology (Section 6.2).



3.0 Methodology

Field surveys and desktop assessment were undertaken for both the impact area and offset site to confirm the presence and relative abundance of MNES and quantify site quality and condition. Surveys were undertaken between October 2016 and June 2019 (Gondwana Ecology Group 2019; Koala Research and Management 2018; 2019) in accordance with the following survey guidelines:

- *Flora Survey Guidelines – Protected Plants version 2.0* (DEHP 2016).
- *Commonwealth Survey Guidelines for Australia's threatened mammals* (McElroy 2004);
- *Guide to Determining Terrestrial Habitat Quality Version 1.2 (the Guide)* (DEHP 2017);
- *Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland Version 5.1* (Neldner et al. 2020);
- *Queensland BioCondition Assessment Manual Version 2.2* (BioCondition) (Eyre et al. 2015); and
- *Queensland Terrestrial Vertebrate Fauna Survey Guidelines* (Eyre et al. 2018).

3.1 Technical Ecology Report

The Technical Ecology Report has been prepared by Gondwana Ecology Group Pty Ltd (2019) to address the ecological assessment requirements of the Project's impact area. The following sections provide a summary of the desktop assessment and field surveys undertaken in the impact area.

3.1.1 Flora

The following reports and databases were used in the Technical Ecology Report (2018) to determine vegetation communities and species likely to be present in the impact area:

- Department of the Environment and Energy (DoEE) (2017) Commonwealth's EPBC Protected Matters Search Tool. The search covered a 2 km radius surrounding the impact area;
- Department of Environment and Heritage Protection (DEHP) (2017) Queensland's Wildlife Online database. The search covered a 10 km radius surrounding the impact area;
- DEHP (2017) Regional Ecosystems Report;
- Department of Natural Resources and Mines (DNRM) (2017) Regulated Vegetation;
- DEHP (2017) Biodiversity and Conservation Values;
- DEHP (2017) Flora Survey Trigger Map;
- Forster et al. (1991) Vineforest Plant Atlas for South-East Queensland; and
- Gondwana Ecology (2016) Protected Plant Survey ENERGEX easement realignment, Karreman Quarry.

Flora surveys were undertaken at 7 sites on 4 October 2016 and 1 November 2017. The impact area was identified as High Risk in the Flora Survey Trigger Map, therefore a timed meander flora survey was conducted within each habitat flora species, structure and condition of vegetation within each habitat were recorded.

3.1.2 Vegetation mapping

Desktop assessment and field surveys were undertaken as part of the Technical Ecology Report (2018) to assess the existing Regional Ecosystem, High Value Regrowth and habitat mapping within the impact area. Desktop assessment was undertaken between 26-27 March 2018. Field surveys were undertaken on 2 April 2018 and were conducted at 39 sites and consisted of the following:

- Vegetation structure and quaternary assessment;
- General traverse of the vegetation communities encountered;
- Field survey and GPS tracking of vegetation boundaries, where they were found to be significantly different to RE Mapping;
- Photographic records were taken for all survey locations and additional observations; and
- Opportunistic flora and fauna survey (for species that may not have been identified on previous flora and fauna surveys).

A Property Map of Assessable Vegetation (PMAV) was submitted and certified by Queensland Department of Natural Resources, Mines and Energy (now Department of Resources) on 20 May 2019.

3.1.3 Fauna surveys

Surveys were undertaken at 7 sites and included an initial site inspection and assessment of habitats, followed by a systematic survey, designed for the target species. At each site, the following were undertaken:

- Elliot Box Traps;
- Hair Traps;
- Pitfall Trap Line;
- Funnel or Folding Traps;
- Bat Detectors (AnaBat);
- Camera trapping; and
- Active searches and spotlighting.

Table 3.1 provides a summary of survey methods used for each site whilst **Table 3.2** provides a summary of survey effort. Field studies included:

- Habitat, protected plant, bird and reptile surveys: 4 October 2017, 21 October and 1 November 2017 (3 days = 7 person days);
- Systematic fauna survey: 23-27 October 2017 (5 days = 10 person days);
- Supplementary targeted fauna and habitat surveys (including reserves/conservation areas in locality): 19-21 November 2017 (3 days = 6 person days); and
- Supplementary fauna and habitat surveys (local conservation areas and site) over six days in 17-22 August 2018 (6 days = 8 person days), included spotlighting and hollow tree watching.



Table 3.1 Survey methods used at each site

Site ID	Method
1	Hair funnels, camera trap, bat detectors,
2	Hair funnels, camera trap, bat detectors, Elliot traps, pitfall traps, cage traps
3	Hair funnels, camera trap, bat detector
4	Hair funnels, camera trap, bat detectors, Elliot traps, pitfall traps, cage traps
5	Hair funnels, camera trap, bat detectors, Elliot traps, pitfall traps, cage traps
6	Hair funnels, camera trap, bat detectors, Elliot traps, pitfall traps, cage traps
7	Elliot traps, pitfall traps, cage traps

Table 3.2 Fauna survey effort

Method	Effort
Elliot traps	240 trap nights
Cages	36 trap nights
Hair funnels	224 trap nights
Pitfall traps	76 trap nights
Funnel/Folding traps	132 trap nights
Anabat	8 trap nights
Active searches (diurnal)	10 days (approximately > 26 person days)
Active searches (nocturnal)	7 nights (approximately 18 person hours)
Call playback	4 nights (various locations)
Camera traps	6 cameras for 28 days/nights
Koala searches	7 days (approximately 16 person hours)

3.2 Koala Research and Management

Koala habitat assessment was undertaken by Koala Research and Management for the impact area in September to December 2017 and the offset site in June 2019. All surveys for Koala were undertaken in accordance with the *EPBC Act Referral Guidelines for the Vulnerable Koala* (DoE 2014). Koala survey effort in the impact area was a total of 80 person hours whilst the offset site was 27 person hours.

Surveys were conducted by suitably qualified personnel with 8-20 years' experience in conducting koala field surveys. The following sections outline the methods used to survey for Koala in both the impact area and offset site.

3.2.1 Systematic Strip Transect

Surveys followed Dique et al. (2004) and aimed to survey for koalas, noting signs of their presence. Transects were positioned across the area, starting at a random point between 1-60 m from the area boundary. Subsequent transects were delineated across the site, spaced parallel at even intervals (usually units of 60 m) to uniformly sample the area. Transects were arranged perpendicular to the grain of the landscape to sample the vegetation and habitat between and along ridge lines, gullies and drainage lines/creeks.

Survey transects ranged between 20-60 m wide depending on the terrain and at intervals of 15-20 m. Trees and canopies were searched with high-powered binoculars and start and finish points were recorded by GPS. Where Koalas were found or signs of habitat use identified, the following information was recorded:

- GPS location;
- Sex (male or female);
- Age (dependent juvenile, sub-adult or adult); and
- Health status (no obvious disease, overt signs of chlamydial disease or other ailments).

3.2.2 Habitat use

Surveys were undertaken by Koala Research and Management (2018) to determine the presence and use of revegetated areas (approximately 28 ha) by koalas. Revegetated plots were searched for koalas or signs of koala use. Where indirect evidence of koala use was identified this was recorded by GPS and included the following:

- Scratches on tree trunks (primarily smooth-barked trees);
- Browsing of the canopy; and
- Faecal pellets beneath trees.

3.3 Greater Glider surveys

Surveys were undertaken by EMM (2019) to determine the presence and use of remnant areas by greater glider. Prior to surveying for greater glider presence, several habitat and flora assessments were conducted including BioCondition, ground-truth vegetation mapping and protected plant surveys.

Two spotlighting surveys prior to EMM (2019) were undertaken targeting nocturnal birds and mammals, including greater glider. Surveys were conducted in April and September 2003, and October 2017 and August 2018 and were completed over a maximum of seven days per survey with an effort of 33 person hours.

3.3.1 Hollow field survey methods

A total of 35 transects within the impact area were completed between 18 and 19 June 2019. Transects were positioned to cover the greatest lengths of homogenous habitat and to detect all potential hollow-bearing trees with surveyors spread out at a maximum of 30 m apart. Suitable trees were recorded using a GPS device.

All trees with the following three attributes were recorded and mapped:

- Hollow-bearing trees >30 cm DBH (alive or dead myrtaceous trees and dead non-myrtaceous trees);



- Hollows >8 m in height; and
- Hollow entrances >5 cm in diameter.

Collected field data included:

- Trees with >30 cm and 50 cm DBH;
- Condition of tree (alive or dead);
- Species (if alive); and
- Hollow entrance diameter (cm).

3.3.2 Spotlighting

Surveys were undertaken between 24 and 27 June 2019 by five experienced surveyors. Survey effort varied between 2.5 and 4 hour spotlighting sessions in accordance with weather conditions and totalled 92.5 person hours. Spotlighting was conducted in accordance with methods outlined in the *Approved Survey Standards: Greater Glider (Petauroides volans)* (DSE 2011) (the standards). A total of 19 x 50 m transects were created using spatial software across the entire site.

All transects were surveyed twice after dark with high powered (>30 W) headtorches and 8.5 x 42 mm binoculars. Transects were surveyed at 10 minutes per 100 linear m of transect to maximise greater glider detection. Based on the approximate total linear length of 15.4 km for all transects and recommended search pace, a total of 51.3 hours was required to cover all transects twice. Where greater glider or any incidental sightings of other endangered, vulnerable or near-threatened (EVNT) species were identified, GPS location was recorded.

3.4 BioCondition surveys

BioCondition field surveys were undertaken to assess habitat quality in both the impact area and offset site. A total of 21 BioCondition surveys were conducted, of which 12 were in the impact area (**Figure 3.1**) and 9 in the offset site (**Figure 3.2**). Field surveys followed the BioCondition (Eyre et al. 2015) and the Guide (DEHP 2017) methodologies.

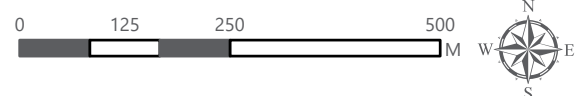
Draft guidance provided by the DAWE (2020) on using modified habitat quality assessment (MHQA) were implemented to better reflect the requirements of the EPBC Act Environmental Offsets Policy (e.g. 'Landscape scale attributes' must include all habitat for the protected matter, for Koala not just remnant and regrowth vegetation) and emailed written advice (e.g. 'The role of site location to species overall population in the state' is *simply scored based on the likelihood that the site contains habitat critical to the survival of the species/community*).



Source: Attexo (2021), DNRME (2021),

Legend

- BioCondition sites
- Study area
- Impact Area Assessment Units
 - AU1
 - AU2
 - AU3
 - AU4
 - AU5
 - AU6
 - AU7
 - AU8
 - Dam
 - Protected areas

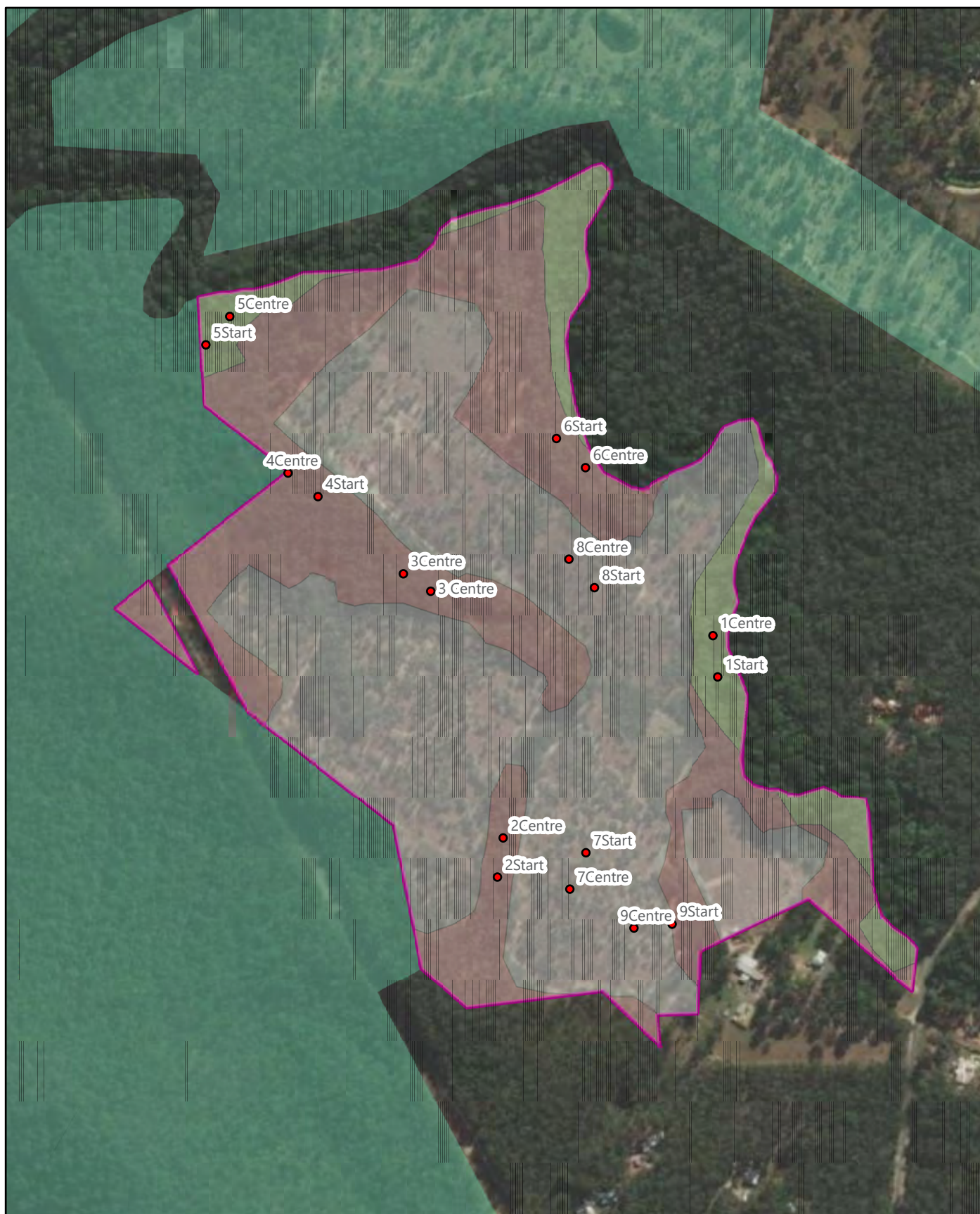


Impact Area Assessment Units

Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 3.1

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

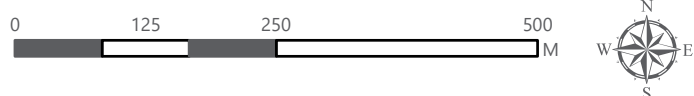
Attexo



Source: Attexo (2021), DNRME (2021),

Legend

- Biocondition Sites V2
- AU5
- AU_No
- Offset boundary
- Protected_areas
- AU1
- AU2
- AU3
- AU4



Offset Site 1 - Pineapple Farm

Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 3.2

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Attexo

4.0 Impact area

4.1 Impact area description

The impact area adjoins Venman Bushland National Park to the south, and to the Don and Christine Burnett Conservation Area by a disturbed boundary to the west. Tingalpa Creek, a locally significant environmental corridor, dissects the impact area within Lot 100 SP234173. The impact area is located within a regionally significant wildlife corridor and extension area is located within KRA 72 (**Figure 1.1**). The immediate surrounding land use is either conservation or rural residential whilst the broader landscape is dominated by urban development.

The impact area is within low rolling hills with slopes ranging from 10° to 70°. Tingalpa Creek is incised into the landscape and steeper slopes are associated with the watercourse. Tingalpa Creek is the major drainage-feature, and the topography drains towards the watercourse from higher ground in the south and north of the impact area. The Impact Area vegetation is dominated by open eucalypt woodland, principally consisting of RE12.11.27 (remnant and regrowth). Two drainage lines also occur within the Impact Area which consist of RE12.3.6. In addition to these vegetation communities there is a small patch of RE12.11.26 and a small patch of RE 12.11.25 on the western boundary.

The following sections present summaries of the habitat values being impacted by the Project for each relevant MNES along with a quantification of the area of impact.

4.1.1 Koala

The impact area was found to support high quality foraging habitat for the species due to the presence of significant tracts of eucalypt woodlands supporting preferred foraging/palatable eucalypt species, see **Figure 4.1**.

The Project is expected to result in the clearing of 51.52 ha of koala habitat.

4.1.2 Grey-headed flying-fox

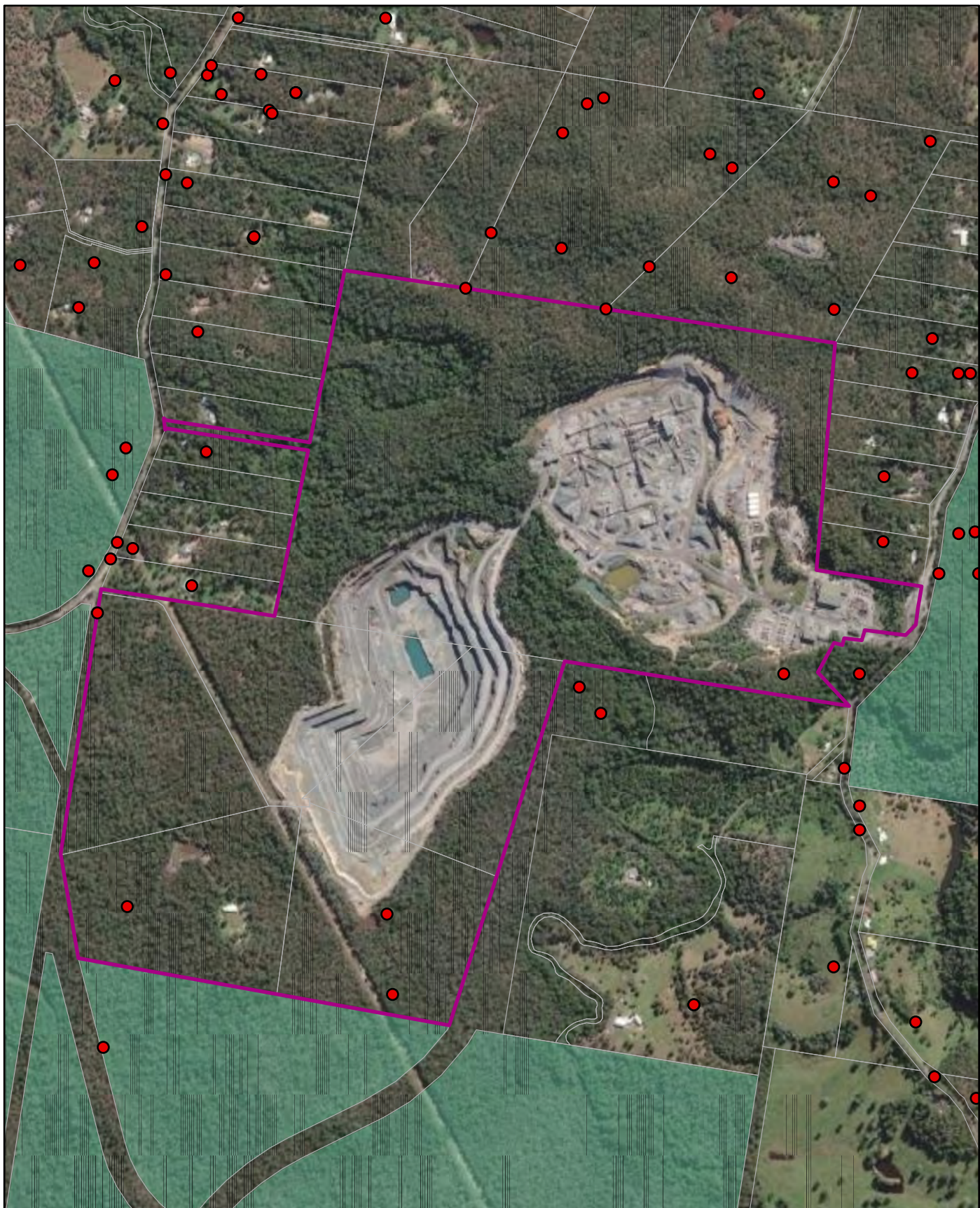
Desktop assessment showed that there are numerous records of the species within a 10 km radius of the impact area, five targeted surveys were conducted within the impact area and the species was recorded twice, see **Figure 4.2**. The species is known to forage within the impact area and preferred foraging habitat was found to be present.

The Project is expected to result in the clearing of 48.3 ha of grey-headed flying-fox habitat.

4.1.3 Greater Glider

Although the species was not detected within the impact area, several records exist within 5-10 km of the impact area. The impact area was found to support high quality foraging habitat for the species due to the presence of significant tracts of eucalypt woodlands supporting preferred foraging/palatable eucalypt species, see **Figure 4.3**. Greater Glider records in proximity to the impact area.

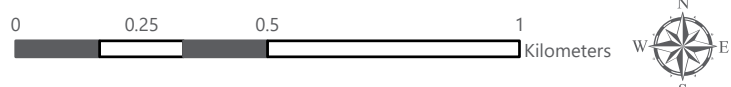
The Project is expected to result in the clearing of 48.3 ha of greater glider habitat.



Source: Attexo (2021), DNRME (2021),

Legend

- Koala Records
- Study_area
- DCDB
- Protected_areas

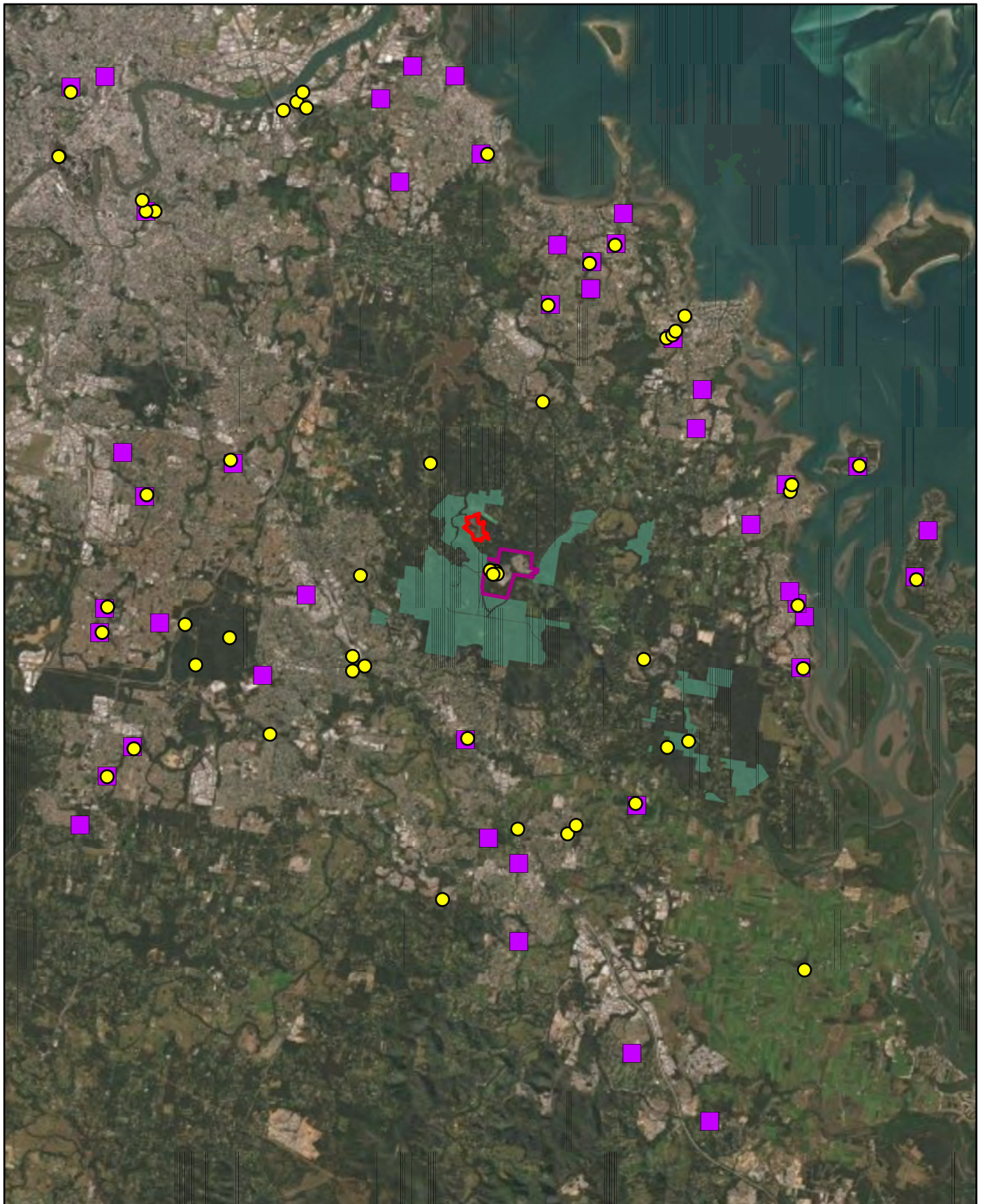


Impact Area Koala Records

Karremman Quarries Pty Ltd
Mount Cotton Quarry
Figure 4.1

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Attexo



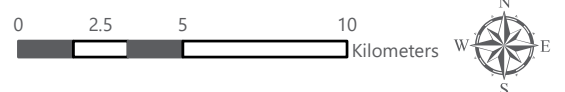
Source: Attexo (2021), DNRME (2021),

Legend

- GHFF_Records
- Known_flying_fox_camps

Offset

- Offset 1
- Study_area
- Protected_areas

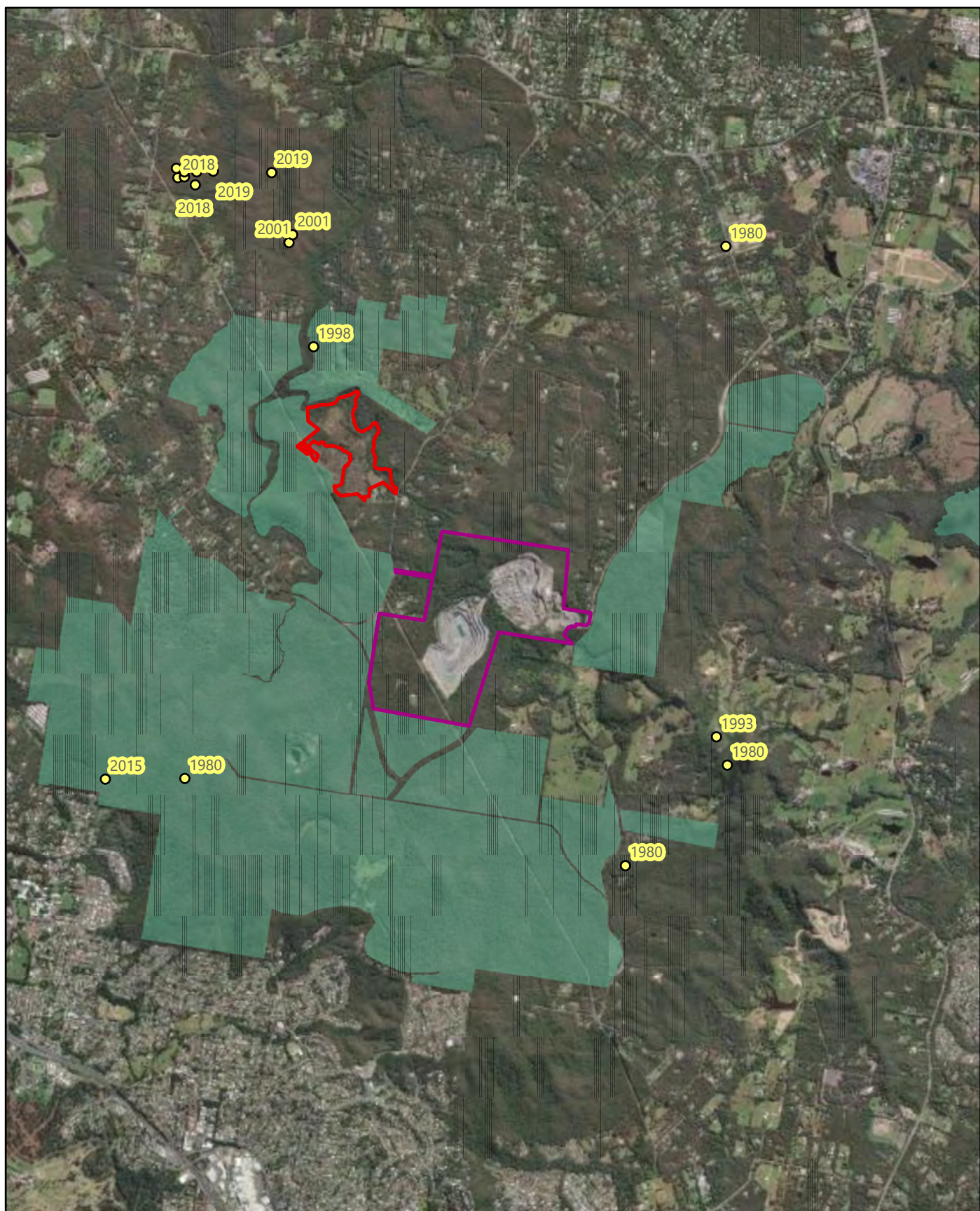


Flying fox camps within foraging
distance of impact site

Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 4.2

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and
the GIS User Community

Attexo



Source: Attexo (2021), DNRME (2021),

Legend

- Greater_glider_records
- Study_area
- Offset
- Offset 1
- Protected_areas

0 1 2 4 Kilometers



Greater Glider records

Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 4.3

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Attexo

5.0 Offset site

5.1 Offset site description

The proposed offset is located 1 km north-west of the Project. It consists of revegetated bushland which was established between 2012 and 2014 as an independent conservation program, along with remnant and regrowth vegetation. The dominant pre-clearance vegetation was eucalypt woodland RE 12.11.24 including species *Eucalyptus crebra*, *E. siderophloia*, *E. resinifera*, *Corymbia intermedia*, *C. trachyphloia* and *C. citriodora* subsp. *variegata* that provide habitat / foraging resources for both Koala and GHFF.

The offset site is directly adjacent to other large tracts of Koala habitat and located adjacent to Tingalpa and Buhot Creeks which are known to provide primary Koala foraging habitat and movement corridors. Remnant vegetation on the property is mapped as 'high value bushland' and cleared areas are mapped as 'medium value rehabilitation' for Koalas by the Queensland Government.

Targeted Koala surveys and habitat quality assessments have been completed across the proposed offset site. One Koala was recorded on the northern boundary near Tingalpa Creek and signs of Koala activity were recorded including scats and scratches within revegetation areas in June 2019 (Koala Research and Management 2019). The offset site is also within 5 km nationally important flying-fox camps and within 3 km of several greater glider records.

The vegetation types that occur within the offset site and their associated areas are described in **Table 5.1**.

Table 5.1 Summary of vegetation communities within the offset site

RE	Description	Area (ha)
12.3.11a	Open forest of <i>Eucalyptus tereticornis</i> and/or <i>E. siderophloia</i> , <i>Lophostemon confertus</i> with vine forest understorey.	4.28
12.11.24	<i>Corymbia intermedia</i> , <i>Eucalyptus acmenoides</i> , <i>E. microcorys</i> and <i>E. propinqua</i>	44.53

The offset site is situated within a bioregional corridor with connectivity to protected areas to the west. The offset site will provide important Koala habitat as well as facilitate Koala movement to the north, west and east into other large core areas of Koala habitat. Planted species include a range of species from the pre-clearing regional ecosystems and further planting is proposed to fully align the planted areas with the pre-clearing regional ecosystems.

This property has been stratified into three AUs that will be used for offset purposes. **Table 5.2** provides a summary of the offset site according to the assigned assessment unit and associated regional ecosystem. Detailed descriptions of each assessment unit are provided in subsequent sections.

Table 5.2 Assessment units within the offset site

Assessment Unit	Regional Ecosystem	Area (ha)	No. Survey Sites	Site Reference
AU1	12.11.24 (non-remnant)	28.27	3	Site 7, Site 8, Site 9
AU2	12.11.24	16.26	4	Site 2, Site 3, Site 4, Site 6
AU3	12.3.11a	4.28 ¹	2	Site 1, Site 5

¹ Note that this AU includes areas mapped as non-remnant that presented similar to adjoining remnant vegetation.

5.1.1 Current site use and management

The offset site is currently essentially unmanaged, except for the advance offset area (AU1) that is subject to occasional weed control. At present there is occasional livestock grazing.

5.1.2 Regional scale benefits

The offset site is situated within a bioregional corridor with connectivity to protected areas to the north, west and south. The proposed offset is mapped as either 'Koala habitat priority restoration area' (non-remnant areas) or 'core habitat area' (remnant areas) as shown on **Figure 5.1**.

5.1.3 Threat to species - Koala

Threat assessment (threat to species) is based on Table 4 in the Guide. Threats for Koala are derived from the relevant conservation advice documents including:

- Approved Conservation Advice: *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Koala Northern Design Table Unit), (DAWE 2012);
- South East Queensland Koala Conservation Strategy 2020–2025 (DES 2020); and
- Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 – 2016 (EPA 2006).

Several of the threats to Koala are interactive. For example, invasion of habitat by non-native plant species has the capacity to increase fire fuel loads, reduce species mobility and limit the establishment of Koala forage species whilst fragmentation by urban development is associated with increased predation by domestic dogs and potentially disease prevalence with increased environmental stress. The threatening processes described in **Table 5.3** are intended to address the major known threats in a format that relates to the habitat assessment method and the management practices proposed for the offset site.

Table 5.3 Key threats Koala

Threat	Description
Loss of habitat	Clearing of habitat associated with anthropogenic disturbance such as urban development and agricultural particularly in areas of high fertility
Fragmentation of habitat	Fragmentation of habitat associated with anthropogenic disturbance, urban development
Habitat Degradation	Reduction in species mobility and contributing to reduced habitat quality and altered fire regimes.
Fire	A direct threat to related to fire related mortality and potentially causing habitat degradation.
Vehicle strike	Mortality caused by the intersection with traffic where Koalas are drawn into remnant areas that occur in association with roads.
Disease	Infection of populations by Chlamydia, Koala Retrovirus and other diseases leading to reduced fecundity.
Predation by dogs	Domestic and/or feral dogs constitute a key threatening process particularly in urban area of SEQ

5.1.4 Threat to species - Grey-headed Flying-fox

Threat assessment (threat to species) is based on Table 4 in the Guide. Threats for GHFF are derived from the relevant conservation advice documents including:

- Ranking the feeding habitats of Grey-headed Flying-foxes for conservation management (Eby and Law 2008);
- Flying-fox Heat Event Response Guidelines (Bishop and Lyons 2018);
- National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (DAWE 2021).

In the case of the GHFF, habitat loss was found to be complex based on the temporal requirements of the species. Loss of winter and spring foraging habitat in SEQ was found to be a particular threat to the species with the current habitat potentially inadequate for the existing population (DAWE 2021). Other key relevant threats to the species included loss of roosting habitat and camp disturbance. The threatening processes described in **Table 5.4** are intended to address the major known threats in a format that relates to the habitat assessment method and the management practices proposed for the offset site.

Table 5.4 Key threats GHFF

Threat	Description
Loss of winter foraging habitat	Loss of diet plants that provide winter foraging resources, <i>Castanospermum austral</i> , <i>Eucalyptus acmenoides</i> , <i>Eucalyptus propinqua</i> , <i>Eucalyptus resinifera</i> , <i>Eucalyptus seeana</i> , <i>Eucalyptus siderophloia</i> , <i>Eucalyptus tereticornis</i> , <i>Lophostemon confertus</i> , <i>Melaleuca quinquenervia</i>
Loss of spring foraging habitat	Loss of diet plants that provide foraging during key breeding periods, <i>Eucalyptus acmenoides</i> , <i>Eucalyptus propinqua</i> , <i>Eucalyptus resinifera</i> , <i>Eucalyptus seeana</i> , <i>Eucalyptus siderophloia</i> , <i>Eucalyptus tereticornis</i> , <i>Lophostemon confertus</i> , <i>Melaleuca quinquenervia</i>
Habitat fragmentation	Fragmentation of habitat affecting species mobility
Camp disturbance	Direct and indirect impacts to known camps
Heat stress	Mortality to individuals caused by daytime temperatures >40C and impacted by habitat condition, proximity to water, camp conditions, population demographics, timing and human conditions. Applies when sites support camps.
Entanglement	Mortality of animals due to entanglement in netting, barbed wire fences (especially associated with water sources) and other anthropogenic structures.
Electrocution	GHFF are prone to electrocution on power lines in urban areas.

5.1.5 Threat to species - Greater Glider

Threat assessment (threat to species) is based on Table 4 in the Guide. Threats for Greater Glider are derived from the relevant conservation advice documents including:

- Approved Conservation Advice: Greater glider (*Petauroides volans*) (TSSC 2016);
- The Action Plan for Australian Mammals (Woinarski et al. 2014).

Cumulative effects of land clearing and logging activities, current burning regimes and the impacts of climate change are a major threat to large hollow-bearing trees on which the greater glider relies. The species is particularly

susceptible to threats because of its slow life history characteristics, specialist habitat requirements (and hence mature forests), and relatively specialised dietary requirements (Woinarski et al. 2014). The key threatening processes are defined as per **Table 5.5**.

Table 5.5 Key threats to Greater Glider

Threat	Description
Habitat loss and fragmentation	The species is highly dependent on forest connectivity and large mature (myrtaceous) trees and is particularly sensitive to forest clearance as prime habitat coincides with areas suitable for land clearance. Habitat loss and fragmentation limits dispersal of the species between smaller isolated fragments and subsequently reduces reproductive outputs and population viability. Limited dispersal ability constrains genetic diversity and weakens resilience thus increasing susceptibility to disturbance. The species is slow to recover from major disturbance (Kavanagh 2004).
Timber production	There is a progressive decline in numbers of hollow-bearing trees in production forests as logging rotations become shorter and as dead stags collapse (Lindenmayer et al. 2011).
Inappropriate fire regimes	Inappropriate and too frequent fire regimes cause population declines in and after high intensity fires (Lindenmayer et al. 2013). The species is sensitive to repeated prescribed burning and abundance is significantly greater in forests that are infrequently burnt (Andrews et al. 1994).
Climate change	The species is florivorous that favours forests with a diversity of eucalypt species and such forest types are susceptible to the effects of climate change that affects fruiting and flowering events, thus exacerbating key threatening processes of the species. Biophysical modelling indicates that the degree of site occupancy is associated with vegetation moisture and water stress from drought affects growth of eucalypt forest and woodlands, therefore limiting the species' food source and causing heat stress and mortality (Lumsden et al. 2013; Matusick et al. 2013). Literature predicts a 3C temperature increase will cause a severe decline in the population, nationally (Kearney et al. 2010).
Increased competition	Sulphur-crested cockatoos (<i>Cacatua galerita</i>) have been observed taking over nesting hollows of powerful owls and along with other hollow-bearing wildlife are likely to be competing with the species for hollows (Lumsden et al. 2013).
Predation by owls	The species forms a significant part of both the powerful owl (<i>Ninox strenua</i>) and sooty owl (<i>Tyto tenebricosa</i>) dietary requirements and have been recorded utilising the same habitat (Bilney et al. 2006). Reduction in the density of hollow-bearing trees increases the threat of predation whilst the species is moving between hollows and localised population declines due to owls have been observed (Lindenmayer et al. 2011).



Source: Attexo (2021), DNRME (2021),

Legend

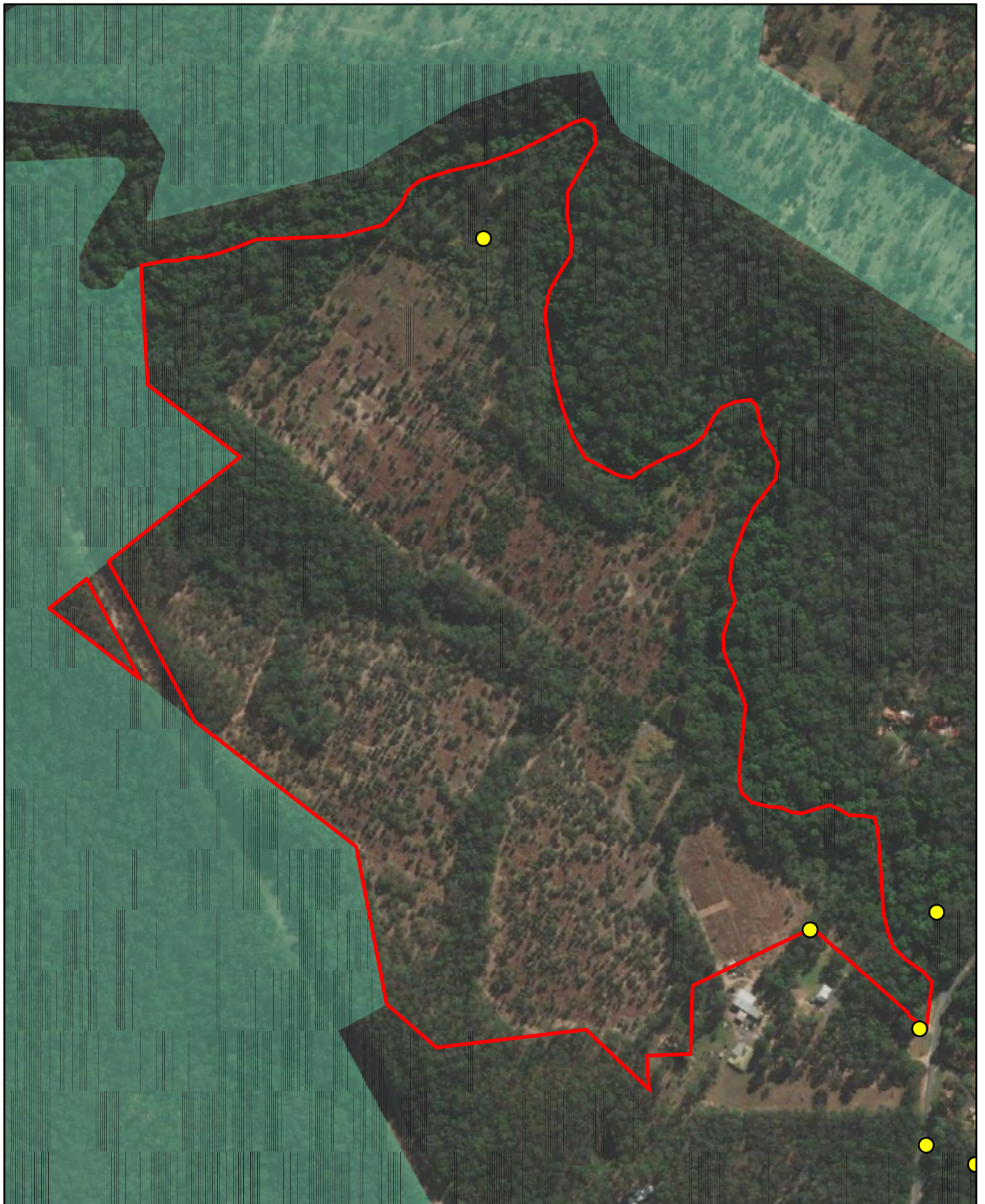
- Karreman Offset Boundary Version 4
- Core koala habitat area
- Locally refined koala habitat area
- Koala habitat restoration area
- Protected areas

0 0.05 0.1 0.2
Kilometers



Queensland Koala Plan
Pineapple Farm

Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 5.1



Source: Attexo (2021), DNRME (2021),

Legend

- Koala records
- Karreman Offset Boundary Version 4
- Protected areas

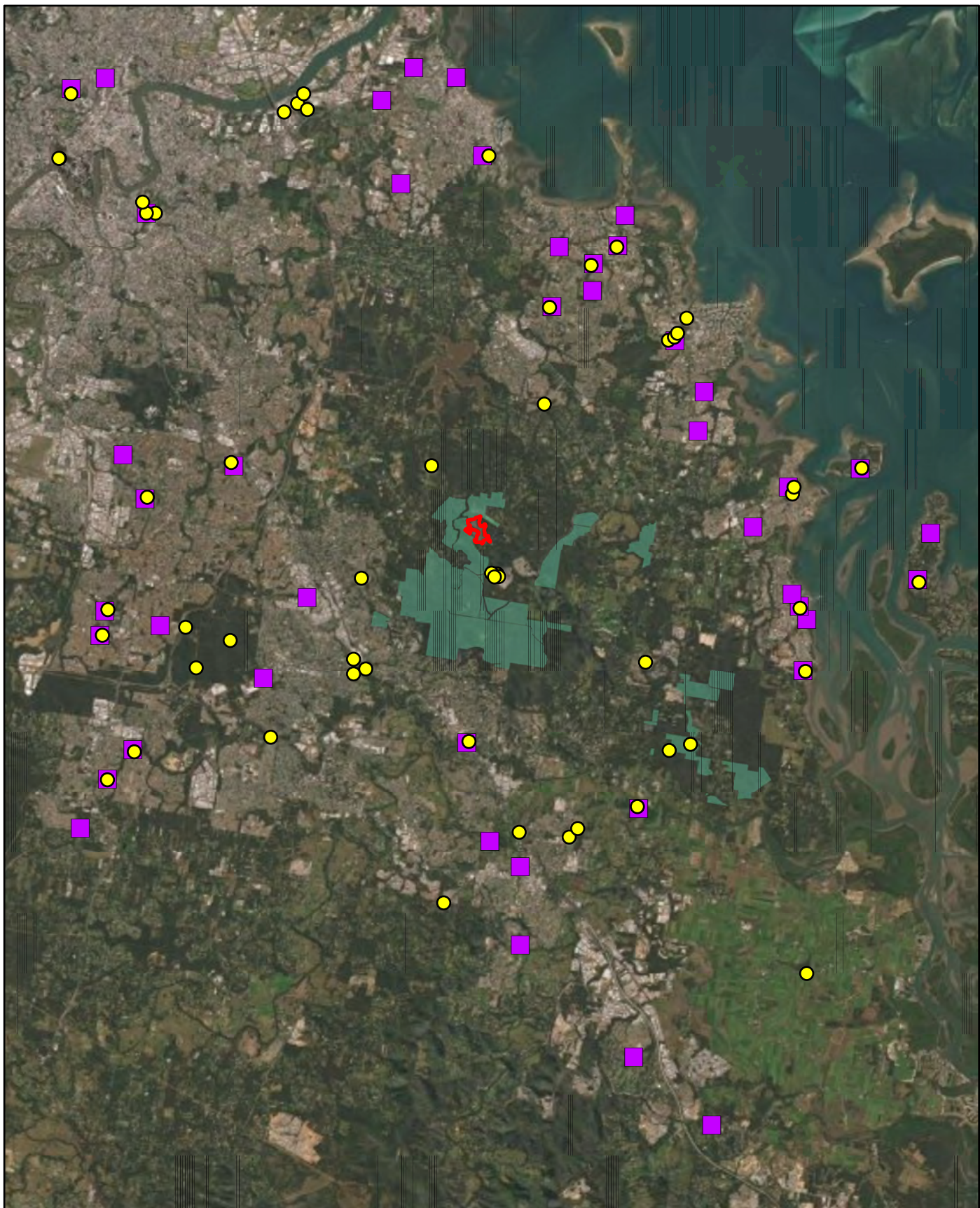


Queensland Koala Plan
Pineapple Farm

Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 5.2

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

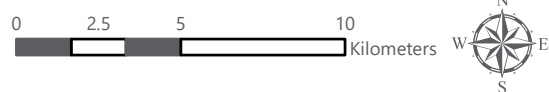
Attexo



Source: Attexo (2021), DNRME (2021),

Legend

- GHFF_Records
- Known_flying_fox_camps
- Offset
- Offset 1
- Protected_areas

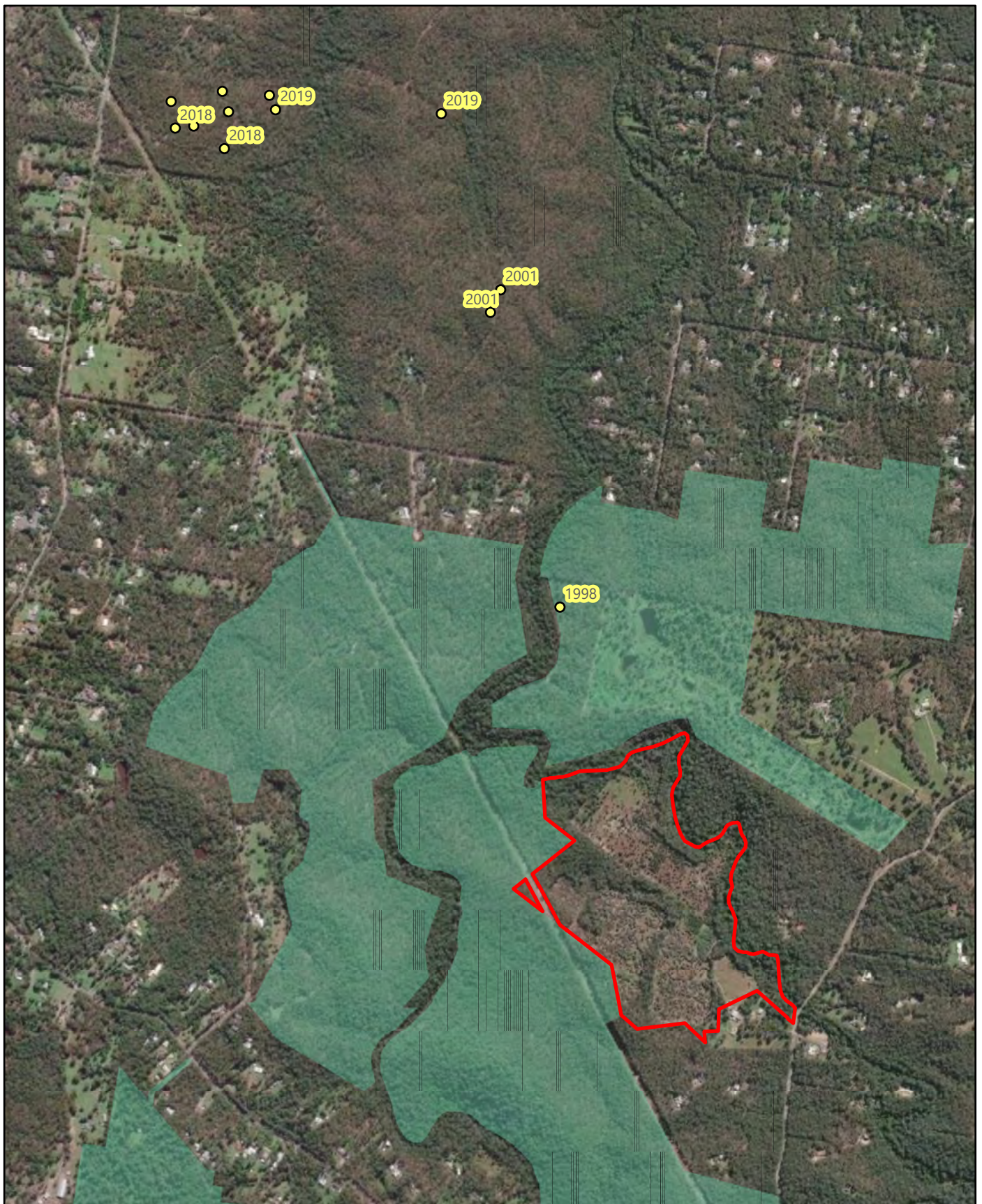


GHFF camps within foraging
distance of offset site

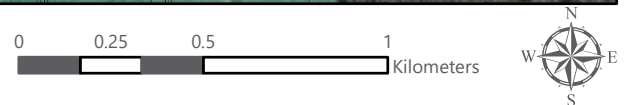
Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 5.3

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and
the GIS User Community

Attexo



Source: Attexo (2021), DNRME (2021),



Legend

- Greater_glider_records
- ▬ Karreman_Offset_Boundary_Ver_3
- Protected_areas

Offset 1 Pineapple Farm
Greater Glider records

Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 5.4

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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5.2 Offset site outcomes

Offset outcomes and management actions necessary to achieve outcomes are presented in **Table 5.6**. **Table 5.6** also identifies the respective completion criteria and relevant timeframes to achieve these outcomes (time to ecological benefit). The non-achievement of the offset outcome will trigger corrective actions. The offset outcomes and management actions are based on key threats and recovery actions specific for each MNES as outlined in **Table 2.1** and have been developed to reflect current conditions at the offset site.

Table 5.6 Offset Outcomes and Management Actions for MNES

Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
Whole of site				
Legally secure for the duration of the impact	Legally secure the offset site under section 19F of the Vegetation Management Act 1999 (Qld)	Milestone 1: NA Milestone 2: NA Milestone 3: NA	Voluntary Declaration (V Dec) in place over offset area within 12 months of the commencement of the Action.	NA
Restrict livestock and vehicle access	Installation of fencing and signage designed to prevent access by livestock and vehicles while providing for the free movement of Koalas.	Milestone 1: NA Milestone 2: NA Milestone 3: NA	Fauna friendly stock exclusion fencing installed within 6 months of commencement of the Action.	Any signs of trespassing by unauthorised personnel and livestock during monitoring activities will trigger review of fencing management measures and general restrictions, and implementation of corrective actions. Corrective actions will be identified and implemented following: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm unauthorised access points • Implement maintenance where required
Reduce fire threat, manage woody debris, reduce weed biomass and improve landscape permeability	Fire management program	Milestone 1: Fire management plan completed 6 months from implementation of OMP. Fire management to be based on recommendations from Regional Ecosystem Database Ver 12 for the relevant regional ecosystem. Fire management planning will include consultation with the landholder with considered measures including appropriate fire intervals, mosaic burns in the appropriate season and intensity for the regional ecosystem.	All other offset management actions completed 20 years from implementation of the OMP. Relevant indicators of appropriate fire management include, weed cover, species richness and stem density scoring meeting benchmark scores for the regional ecosystem.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes including revision of physical fire control management actions (i.e. firebreaks and updating Section 9.5.5)



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
		Milestone 2: Fire management plan recommendations commence implementation 12 months of implementation of OMP. Milestone 3: NA		
Manage threat associated with pest species including roaming domestic dogs	Pest management program	Milestone 1: Pest management plan completed within 6 months of implementation of OMP. Milestone 2: Pest monitoring program in place within 12 months of implementation of OMP. Pest control program will target, wild dogs, roaming domestic dogs, cats, pigs and foxes using a range of techniques including baiting and trapping in concert with the Redlands Coast Biosecurity Plan 2018 – 2023 and the associated pest animal objectives. Milestone 3: NA	All other offset management actions completed 20 years from implementation of the OMP and scoring components associated with impacts by pests met, indicators primarily include relevant abundance against baseline monitoring.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. Corrective actions will be identified and implemented following: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm the presence of pest animals; • Targeted pest animal surveys within the offset site to identify the magnitude of the issue; and • Review of current pest animal control measures And will be: • Undertaken in accordance with Queensland DAF guidelines and frequency and methods adequate for the identified pest animal.
Improve general habitat condition, community resilience, improved foraging resources	Recruitment of woody perennial EDL species	Milestone 1: Recruitment of woody perennial EDL species >50% of BioCondition Benchmark for relevant RE and associated tree richness benchmark 10 years from implementation of OMP. Milestone 2: Recruitment of woody perennial EDL species >90% of BioCondition Benchmark for relevant RE and associated tree richness benchmark 15 years from implementation of OMP.	Recruitment of woody perennial EDL species >90% of BioCondition Benchmark for relevant RE and associated tree richness benchmark 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in recruitment of woody perennial EDL is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5,



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
		Milestone 3: NA		and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Native species richness: Trees (enrichment planting and seeding as described in Section 9.5)	Milestone 1: Native shrub richness >25% of BioCondition Benchmark for relevant RE 5 years from implementation of OMP. Milestone 2: Native shrub richness >50% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: Native shrub richness >90% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP.	Native tree richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in native tree richness is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Native species richness: Shrubs (enrichment planting and seeding as	Milestone 1: Native shrub richness >25% of BioCondition Benchmark for relevant RE 10 years from implementation of OMPs.	Native shrub richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in native shrub richness is a result of



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
	described in Section 9.5)	Milestone 2: Native shrub richness >90% of BioCondition Benchmark for relevant RE 15 years from implementation of OMPs. Milestone 3: NA	years from implementation of OMP.	livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Native species richness: Grasses (enrichment planting and seeding as described in Section 9.5)	Milestone 1: Native grass richness >25% of BioCondition Benchmark for relevant RE 5 years from implementation of OMP. Milestone 2: Native grass richness >50% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: Native grass richness >90% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP.	Native grass richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in native grass richness is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				ensure consistency with completion criteria.
	Native species richness: Forbs/other (enrichment planting and seeding as described in Section 9.5)	Milestone 1: Native forbs/other richness >25% of BioCondition Benchmark for relevant RE 5 years from implementation of OMP. Milestone 2: Native forbs/other richness >50% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: Native forbs/other richness >90% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP.	Native forb richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in native forb richness is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Tree canopy height (tree establishment and growth management as described in Section 9.5 and 9.5.3)	Milestone 1: Tree canopy height >25% of BioCondition Benchmark (as described in appendix a and appendix b) for relevant RE 7 years from implementation of OMP. Milestone 2: Tree canopy height >50% of BioCondition Benchmark (as described in appendix a and appendix b) for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Tree canopy height >70% of BioCondition Benchmark for relevant RE 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in tree canopy height is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue;



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				• Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Tree canopy cover (tree establishment and growth management as described in Section 9.5 and 9.5.3)	Milestone 1: Tree canopy cover >25% of BioCondition Benchmark (as described in appendix a and appendix b) for relevant RE 7 years from implementation of OMP. Milestone 2: Tree canopy cover >50% of BioCondition Benchmark (as described in appendix a and appendix b) for relevant RE 10 years from implementation of OMP. Milestone 3: NA	Tree canopy cover >50% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in tree canopy cover is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Shrub canopy cover (plant establishment and growth management as described in Section 9.5 and 9.5.3)	Milestone 1: Shrub canopy cover >20% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: Shrub canopy cover >50% of BioCondition Benchmark for relevant RE 15	Shrub canopy cover >50% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in shrub canopy cover is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
		years from implementation of OMP. Milestone 3: NA		infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Native perennial grass cover (plant establishment and growth management as described in Section 9.5)	Milestone 1: Native perennial grass cover >25% of BioCondition Benchmark for relevant RE 10 years from implementation of OMPs. Milestone 2: Native perennial grass cover >50% of BioCondition Benchmark for relevant RE 15 years from implementation of OMPs. Milestone 3: Native perennial grass cover >75% of BioCondition Benchmark for relevant RE 18 years from implementation of OMPs.	Native perennial grass cover >90% of BioCondition Benchmark for relevant RE at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in native perennial grass cover is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
	Organic litter (development as described in Section 9.5.2)	Milestone 1: Organic litter cover >25% of BioCondition Benchmark for relevant RE 10 years from implementation of OMPs. Milestone 2: Organic litter cover >50% of BioCondition Benchmark for relevant RE 15 years from implementation of OMPs. Milestone 3: Organic litter cover >75% of BioCondition Benchmark for relevant RE 18 years from implementation of OMPs.	Organic litter cover >90% of BioCondition Benchmark for relevant RE at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in organic litter cover is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation and/or unauthorised “cleaning up” activities, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Coarse woody debris (development as described in Section 9.5.2)	Milestone 1: Coarse woody debris >50% & <200% of BioCondition Benchmark for relevant RE 5 years after legally securing the offset. Milestone 2: NA Milestone 3: NA	Coarse woody debris >50% & <200% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction or overabundance in coarse woody debris is a result of livestock grazing and/or fire management and/or pest animal damage and/or weed infestation and/or unauthorised “cleaning up” activities, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly)



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Undertake weed control program (as detailed in Section 9.4)	Milestone 1: Non-native plant cover reduced to <4% 5 years from implementation of OMP. Milestone 2: NA Milestone 3: NA	Non-native plant cover measures less than <4% for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. The following corrective actions will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm the issue and inform any necessary additional weed monitoring activities within the offset site to identify the extent of the issue; • Review current weed control and management measures to ensure risk is as low as reasonably achievable; and • If required, increase the frequency of weed control actions and monitoring. Should the non-native plant cover be >4% in Year 15, Karreman Quarries will undertake additional targeted weed surveys to identify hotspots and species-specific control actions.
AU 1				
	Number of large trees	Milestone 1: Number of large trees >25% of BioCondition	Number of large trees >50% of BioCondition	Should the site fail to meet milestone targets, Karreman



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
	(development as using methods described in Section 9.5)	Benchmark for relevant RE 12 years from implementation of OMP. Milestone 2: Number of large trees >35% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Benchmark for relevant RE 20 years from implementation of OMPs.	Quarries will undertake an assessment of possible causes. If reduction in number of large trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
Improve quality and availability of foraging habitat Koala	Density of non-juvenile Koala habitat tree density (as detailed in Section 9.5)	Milestone 1: Non-juvenile Koala habitat tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: Non-juvenile Koala habitat tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Non-juvenile Koala habitat tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of non-juvenile Koala habitat trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue;



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				- Review of current attributable management measures; and - If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Density of Juvenile Koala habitat tree density (as detailed in Section 9.5)	Milestone 1: Juvenile Koala habitat tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: Juvenile Koala habitat tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Juvenile Koala habitat tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of juvenile koala habitat trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: - A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; - Additional targeted surveys to identify the magnitude of the attributable issue; - Review of current attributable management measures; and - If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Koala habitat tree richness (as detailed in Section 9.5)	Milestone 1: Koala habitat tree richness >90% of BioCondition Benchmark for relevant RE 7 years from implementation of OMPs. Milestone 2: NA Milestone 3: NA	Koala habitat tree richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in Koala habitat tree richness is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
Improve quality and availability of shelter habitat for Koala	Density of Koala refuge trees (as detailed in Section 9.5 and 9.5.4)	Milestone 1: Koala refuge tree density >50% of BioCondition Benchmark for relevant RE 12 years from implementation of OMP. Milestone 2: Koala refuge tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Koala refuge tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of Koala refuge trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
	Density of non-juvenile trees with dense crowns (as detailed in Section 9.5.4)	Milestone 1: Density of non-juvenile trees with dense crowns >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: Density of non-juvenile trees with dense crowns >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Density of non-juvenile trees with dense crowns >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of non-juvenile trees with dense crowns is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
Improve quality and availability of foraging habitat GHFF	Density of GHFF forage trees (as detailed in Section 9.5)	Milestone 1: GHFF forage tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: GHFF forage tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	GHFF forage tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of GHFF forage trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				magnitude of the attributable issue; - Review of current attributable management measures; and - If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Density of high yield GHFF forage trees (as detailed in Section 9.5)	Milestone 1: High yield GHFF forage tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: High yield GHFF forage tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	High yield GHFF forage tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of high yield GHFF forage trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: - A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; - Additional targeted surveys to identify the magnitude of the attributable issue; - Review of current attributable management measures; and - If required, amendment of attributable management measure to ensure consistency with completion criteria.
	GHFF forage tree richness (as detailed in Section 9.5)	Milestone 1: GHFF forage tree richness >90% of BioCondition Benchmark for relevant RE 7 years from implementation of OMPs. Milestone 2: NA Milestone 3: NA	GHFF forage tree richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in GHFF forage tree richness is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
AU 2				
	Number of large trees (development as using methods described in Section 9.5)	Milestone 1: Number of large trees >50% of BioCondition Benchmark for relevant RE in all areas 10 years from implementation of OMP. Milestone 2: Number of large trees >75% of BioCondition Benchmark for relevant RE in all areas 15 years from implementation of OMP. Milestone 3: NA	Number of large trees >=100% of BioCondition Benchmark for relevant RE in all areas 20 years from implementation of OMPs.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in number of large trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				ensure consistency with completion criteria.
Improve quality and availability of foraging habitat Koala	Density of non-juvenile Koala habitat tree density (as detailed in Section 9.5)	Milestone 1: Non-juvenile Koala habitat tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: Non-juvenile Koala habitat tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Non-juvenile Koala habitat tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of non-juvenile Koala habitat trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Density of Juvenile Koala habitat tree density (as detailed in Section 9.5)	Milestone 1: Juvenile Koala habitat tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: Juvenile Koala habitat tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Juvenile Koala habitat tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of Juvenile Koala habitat trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5,



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Koala habitat tree richness (as detailed in Section 9.5)	Milestone 1: Koala habitat tree richness >90% of BioCondition Benchmark for relevant RE 7 years from implementation of OMPs. Milestone 2: NA Milestone 3: NA	Koala habitat tree richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in Koala habitat tree richness is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
Improve quality and availability of shelter habitat for Koala	Density of Koala refuge trees (as detailed in Section 9.5)	Milestone 1: Koala refuge tree density >50% of BioCondition Benchmark for relevant RE 12 years from implementation of OMP.	Koala refuge tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes.



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
		Milestone 2: Koala refuge tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	at final monitoring 20 years.	If reduction in density of Koala refuge trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
Improve quality and availability of foraging habitat GHFF	Density of GHFF forage trees (as detailed in Section 9.5)	Milestone 1: GHFF forage tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: GHFF forage tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	GHFF forage tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of GHFF forage trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Density of high yield GHFF forage trees (as detailed in Section 9.5)	Milestone 1: High yield GHFF forage tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: GHFF forage tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	GHFF forage tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of high yield GHFF forage trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: - A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; - Additional targeted surveys to identify the magnitude of the attributable issue; - Review of current attributable management measures; and - If required, amendment of attributable management measure to ensure consistency with completion criteria.
	GHFF forage tree richness (as detailed in Section 9.5)	Milestone 1: GHFF forage tree richness >90% of BioCondition Benchmark for relevant RE 7 years from implementation of OMPs. Milestone 2: NA Milestone 3: NA	GHFF forage tree richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in GHFF forage tree richness is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: A review and evaluation of monitoring results



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
AU 3				
	Number of large trees (development as using methods described in Section 9.5)	Milestone 1: Number of large trees remains above >100% of BioCondition Benchmark for relevant RE after 10 years from implementation of OMP. Milestone 2: Number of large trees remains above >100% of BioCondition Benchmark for relevant RE after 15 years from implementation of OMP. Milestone 3: NA	Number of large trees remains $\geq 100\%$ of BioCondition Benchmark for relevant RE 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in number of large trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
Improve quality and availability of foraging habitat Koala	Density of non-juvenile Koala habitat tree (as	Milestone 1: Non-juvenile Koala habitat tree density >50% of BioCondition Benchmark for	Non-juvenile Koala habitat tree density >90% of BioCondition Benchmark for relevant	Should the site fail to meet milestone targets, Karreman Quarries will undertake an



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
	detailed in Section 9.5)	relevant RE 5 years from implementation of OMP. Milestone 2: Non-juvenile Koala habitat tree density >75% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 3: NA	RE for two consecutive monitoring periods and at final monitoring 20 years.	assessment of possible causes. If reduction in density of non-juvenile Koala habitat trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Density of Juvenile Koala habitat tree density (as detailed in Section 9.5)	Milestone 1: Juvenile Koala habitat tree density >50% of BioCondition Benchmark for relevant RE 5 years from implementation of OMP. Milestone 2: Juvenile Koala habitat tree density >75% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 3: NA	Juvenile Koala habitat tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of Juvenile Koala habitat trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				magnitude of the attributable issue; - Review of current attributable management measures; and - If required, amendment of attributable management measure to ensure consistency with completion criteria.
Improve quality and availability of shelter habitat for Koala	Density of Koala refuge trees (as detailed in Section 9.5 and 9.5.4)	Milestone 1: Koala refuge tree density >50% of BioCondition Benchmark for relevant RE 12 years from implementation of OMP. Milestone 2: Koala refuge tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	Koala refuge tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of Koala refuge trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: - A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; - Additional targeted surveys to identify the magnitude of the attributable issue; - Review of current attributable management measures; and - If required, amendment of attributable management measure to ensure consistency with completion criteria.
Improve quality and availability of foraging habitat GHFF	Density of GHFF forage trees (as detailed in Section 9.5)	Milestone 1: GHFF forage tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: GHFF forage tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP.	GHFF forage tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of GHFF forage trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
		Milestone 3: NA		animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.
	Density of high yield GHFF forage trees (as detailed in Section 9.5)	Milestone 1: High yield GHFF forage tree density >50% of BioCondition Benchmark for relevant RE 10 years from implementation of OMP. Milestone 2: GHFF forage tree density >75% of BioCondition Benchmark for relevant RE 15 years from implementation of OMP. Milestone 3: NA	High yield GHFF forage tree density >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in density of high yield GHFF forage trees is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to



Outcome	Management Action	Milestones	Completion criteria	Management trigger and corrective actions
				ensure consistency with completion criteria.
	GHFF forage tree richness (as detailed in Section 9.5)	Milestone 1: GHFF forage tree richness >90% of BioCondition Benchmark for relevant RE 7 years from implementation of OMPs. Milestone 2: NA Milestone 3: NA	GHFF forage tree richness >90% of BioCondition Benchmark for relevant RE for two consecutive monitoring periods and at final monitoring 20 years from implementation of OMP.	Should the site fail to meet milestone targets, Karreman Quarries will undertake an assessment of possible causes. If reduction in GHFF forage tree richness is a result of livestock grazing and/or fire management and/or unauthorised clearing and/or weed infestation and/or pest animal damage, the following will be undertaken: • A review and evaluation of monitoring results from annual site quality assessment (Year 1-5, and subsequent 5 yearly) to confirm attributable issue; • Additional targeted surveys to identify the magnitude of the attributable issue; • Review of current attributable management measures; and • If required, amendment of attributable management measure to ensure consistency with completion criteria.



6.0 Risk analysis

6.1 Risk of loss

The *Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act* (the Guide) (Maseyk et al. 2017) was reviewed to determine an appropriate Risk of Loss score for the offset and inform relevant offset calculations in accordance with the Offsets Policy and Offsets Assessment Calculator Guide.

The Risk of Loss score is a percentage figure that describes the change that the habitat on the offset site will be completely lost (i.e. no longer hold value for the MNES) over the foreseeable future (20 years) and estimated for both with and without offset conditions.

The anticipated Risk of Loss over 20 years for the offset site is 2.80 % based on the Redland local government area (LGA) that the project infrastructure falls within (Maseyk et al. 2017). This is appropriate as the risk of loss in the Redland LGA and reflects the observed rate of clearing in that region.

6.2 Analysis of risk

This OMP has considered the risks that may inhibit achieving the completion criteria for the offset site, including risks outside the approval holder's control. The risks have been assessed using the template supplied by DAWE. This OMP and risk analysis includes management triggers and corrective actions to be implemented to manage non-achievement of the performance indicators.

Risk Analysis Matrix (DAWE 2021)

RISK MATRIX	
<u>Likelihood</u> (L): A qualitative measure of likelihood how likely is it that this event/circumstances will occur both before and after management activities are implemented	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
<u>Consequence</u> (C): Qualitative measure of what will be the consequence/result if the issue does occur	
Minor	Minor incident of environmental damage that can be reversed (e.g. short-term delays to achieving strategy objectives, implementing low-cost, well-characterised corrective actions)
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts (e.g. short-term delays to achieving strategy objectives, implementing well-characterised, high cost/effort corrective actions)
High	Substantial instances of environmental damage that could be reversed with intensive efforts (e.g. medium-long term delays to achieving objectives, implementing uncertain, high-cost/effort corrective actions)
Major	Major loss of environmental amenity and real danger of continuing (e.g. strategy objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies)
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage (e.g. strategy objectives are unable to be achieved, with no evidenced mitigation strategies)
Final Risk Rating (R): A function of multiplying <u>Likelihood</u> (L) and <u>Consequence</u> (C)	



		Consequence				
Likelihood		Minor	Moderate	High	Major	Critical
	Highly Likely	Medium	High	High	Severe	Severe
	Likely	Low	Medium	High	High	Severe
	Possible	Low	Medium	Medium	High	Severe
	Unlikely	Low	Low	Medium	High	High
	Rare	Low	Low	Low	Medium	High

Table 6.1 Risk Analysis Table

Risk Event	Risk Description	Initial Risk Rating*			Management Measures / Actions	Residual Risk Rating*			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanism
		L	C	R		L	C	R				
Force Majeure Events												
Drought	Extreme weather event	Likely	Moderate	Medium	Offset likely to be resistant to permanent failure due to drought as based on facilitation of natural regeneration. Annual monitoring to recognise the likelihood of drought temporarily affecting vegetation health, growth and habitat quality scores	Likely	Moderate	Medium	By 2036 and 2041, achieve offset calculator score of 8 for Koala, 9 for GHFF and 6 for Greater Glider.	Completion criteria not met	Review of offset performance and OMP to identify root causes of non-achievement and appropriate modifications to management actions	Monitoring of representative permanent transects
Cyclones / Severe tropical lows / flooding	Extreme weather event	Likely	Minor	Low	Biannual monitoring for signs of flood related damage especially damage to fences and access tracks	Likely	Minor	Low	Fences intact and access tracks serviceable each monitoring event	Fences damaged or access tracks compromised	Repair damaged fences and access tracks	Offset site monitoring



Risk Event	Risk Description	Initial Risk Rating*			Management Measures / Actions	Residual Risk Rating*			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanism
		L	C	R		L	C	R				
Catastrophic Bushfire	Extreme weather event or uncontrolled burn causing habitat degradation and loss of biodiversity	Possible	Critical	Severe	Fire management activities as described in Section 9.5.5	Unlikely	High	Medium	Fire breaks serviceable each monitoring event.	Fire breaks not serviceable.	Fire break maintenance. Fuel hazard reduction burns (Section 9.5.5).	Fire break and fuel load (biomass) monitoring
Standard Risks												
The Offset failing (regardless of cause)	Offset area cannot support MNES	Possible	Critical	Severe	All management actions described in Section 9.0	Rare	Critical	High	By 2036 and 2041, achieve offset calculator score of 8 for Koala, 9 for GHFF and 6 for Greater Glider.	There is a 30% decline in Habitat Quality Score compared with Start Score.	In the event of total failure of the offset, DAWE would require, and the approval holder commits to providing, a replacement offset. That replacement offset would be agreed with the DAWE within twenty-four months of the failure of the offset becoming apparent.	Monitoring of representative permanent transects
Offset Funding Shortfall	Inadequate funds provided to support required	Possible	Critical	Severe	Karreman Quarries has set aside the required funds	Unlikely	Critical	High	All management actions recommended in annual monitoring	Recommended management actions incomplete in subsequent years	Karreman Quarries to provide budgeting and schedule for completion of required works	Offset site monitoring



Risk Event	Risk Description	Initial Risk Rating*			Management Measures / Actions	Residual Risk Rating*			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanism
		L	C	R		L	C	R				
	management activities				plus a 20% contingency				reports completed within 12 months			
Impacts from incompatible land management practices on adjacent properties	Adjoining landholder land management practices impact on offset site condition or values	Possible	High	Medium	Offset property will take responsibility for maintenance of fences and firebreaks identified as important for the offset site.	Unlikely	High	Medium	No impacts from neighbouring properties identified during biannual monitoring events	Impacts from neighbouring properties identified (e.g. neighbours livestock accessing offset site)	Liaison with neighbouring landholders to identify causes and possible solutions.	Offset site monitoring
Erosion	Damage to soils and vegetation, access tracks and fence lines	Possible	Minor	Low	Fencing to restrict livestock grazing. Pest animal monitoring and controls where required.	Possible	Minor	Low	Fences intact and access tracks serviceable. No areas of new active severe erosion.	Fences damaged or access tracks compromised. New area of active severe erosion established.	Repair damaged fences, access tracks or erosion issue.	Offset site monitoring
Timber harvesting/collection	Loss of habitat features and damage to supporting vegetation	Unlikely	Moderate	Low	Fencing to prohibit entry from unauthorised personnel, clear signage to recognise offset site as a conservation area	Rare	Moderate	Low	No evidence of timber harvesting in the offset site.	Evidence of trespassing in the offset site	Communication with landholder to identify and implement improved site restriction measures	Offset site monitoring



Risk Event	Risk Description	Initial Risk Rating*			Management Measures / Actions	Residual Risk Rating*			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanism
		L	C	R		L	C	R				
Unplanned clearing	Loss of habitat features and damage to supporting vegetation	Unlikely	Major	High	Fencing to prohibit entry from unauthorised personnel, clear signage to recognise offset site as a conservation area	Rare	Major	Medium	No evidence of unauthorised vegetation clearing in the offset site	Evidence of unauthorised vegetation clearing or trespassing in the offset site	Communication with landholder to identify and implement improved site restriction measures	Offset site monitoring
New infestations of invasive weed species in the offset area	Degradation of habitat features and suppression of supporting vegetation growth	Possible	High	Medium	Weed hygiene protocols as outlined in Section 9.4.4 . Monitor for new weed infestations (Section 10.2)	Unlikely	Low	Low	No new declared, high threat weeds (koala) or WoNS weeds introduced to the offset site	New declared, high threat weeds (koala) or WoNS introduced to the offset site	Review weed hygiene protocols if required. Identify and implement appropriate weed control methods as necessary	Offset site monitoring



Risk Event	Risk Description	Initial Risk Rating*			Management Measures / Actions	Residual Risk Rating*			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanism
		L	C	R		L	C	R				
Expansion of existing infestations of declared weed species in the offset area	Degradation of habitat features and suppression of supporting vegetation growth through increase competition from declared weeds	Possible	High	Medium	Weed control activities as detailed in Section 9.4 . Monitor for new weed infestations (Section 10.2)	Unlikely	Moderate	Low	Declared weed cover less than cover at start of offset (BioCondition sites) and no new infestation areas	Declared weed cover increased at BioCondition sites relative to start of offset or new infestation area recorded	Identify and implement appropriate weed control methods as necessary	Offset site monitoring
Increased population of pest animals in the offset area.	Wild dog attack on Koala or habitat, degradation from rabbits, pigs or other pest animals including suppression of	Possible	Moderate	Medium	Fencing to restrict pest animal movement. Pest animal monitoring (Section 9.7).	Unlikely	Moderate	Low	No evidence of pest animals or fence damage in the offset site	Evidence of pest animals or fence damage in the offset site	Identify and implement appropriate pest animal control activities as necessary. Repair fences if applicable.	Offset site monitoring



Risk Event	Risk Description	Initial Risk Rating*			Management Measures / Actions	Residual Risk Rating*			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanism
		L	C	R		L	C	R				
	vegetation growth											
Unauthorised or inappropriate grazing in offset area	Degradation of habitat features and suppression of vegetation growth	Possible	High	Medium	Establishment and maintenance of livestock fencing. Use of conservation grazing where appropriate to manage fire fuel load as detailed in Section 9.8.	Unlikely	Minor	Low	No unauthorised livestock in offset area.	Unauthorised livestock present.	Remove livestock and repair fence damage where applicable / review conservation grazing protocols to identify and address root causes and solutions.	Offset site monitoring

6.3 Confidence in offset and outcomes

At 20 years from the commencement of management and monitoring activities (time to ecological benefit), the quality of offset site conditions will be equal to or greater than that within the disturbed site prior to disturbance occurring from the Project (according to site-based attributes) based on the following:

- Recruitment of woody perennial EDL species is >75 % of benchmark;
- Native tree, shrub, grass and forb richness is >90 % of benchmark;
- Tree canopy height is >70 % of benchmark;
- Tree and shrub canopy cover is >50 % of benchmark;
- Native perennial grass cover and organic litter cover is >90 % of benchmark; and
- Non-native plant cover is <4 %.

Specifically, an increase in the following MNES habitat attributes will be achieved:

- Density of koala foraging and shelter habitat trees is >90 % of benchmarks;
- Density of greater glider foraging and shelter habitat trees is >90% of benchmarks; and
- Density of grey-headed flying-fox foraging and shelter habitat trees is >90 % of benchmarks.

There is a high degree of confidence (> 90%) in the management and monitoring activities and offset outcomes outlined in this OMP as it has been developed and reviewed in partnership with suitably qualified restoration ecologists. In addition, a high degree of confidence in this OMP and the offset is attributed to the following:

- Competent and experienced operators will implement management and monitoring actions;
- Offset site management will engage closely with the landowner;
- Management and monitoring actions are based on previous approved relevant OMPs;
- Survey methods, management and monitoring are based on approved conservation advice and survey guidelines;
- Offset site selected to meet all site-based and landscape-scale habitat and ecological requirements of the MNES species;
- Long-term protection of the offset will be achieved through the security mechanism (on land title);
- The application of a risk-based approach, where the results of monitoring activities will inform corrective actions to be implemented.

6.4 Offset site legal security mechanism

Once the final offset package has been agreed, the offset site will be legally secured for offset purposes following Section 29 of the Queensland *Environmental Offsets Act 2014* (Offsets Act) as an area declared as an area of high nature conservation value under the *Vegetation Management Act 1999* (VM Act), section 19F.

The VM Act provides a mechanism of voluntary protection to areas of native vegetation not otherwise protected by the Act. This mechanism is a voluntary declaration and will be used to legally secure the offset site to satisfy Principle 2 of the *EPBC Environmental Offsets Policy Principles* and meet offset area requirements under the Offset Act.

Karreman Quarries will enter into a contract with the landowner of the offset site in which the landowner:

- Accepts the land use restrictions within the offset site; and
- Agrees to the area being managed and monitored by Karreman Quarries until all completion criteria are achieved in exchange for an agreed package of financial compensation.

Karreman Quarries will maintain responsibility for funding and the completion of all management actions until all completion criteria are achieved. Karreman Quarries will be responsible for undertaking the management actions or compensating the landholder management or sourcing and paying subcontractors to undertake the management actions until that point.

6.5 Compliance with the offsets policy principles

The *EPBC Environmental Offsets Policy* provides eight overarching principles that are applied in determining the suitability of offsets. **Table 6.2** provides these eight principles and further details of how this OMP and the offset site address these and demonstrate compliance.

Table 6.2 Environmental Offsets Policy Principles

Principles of the Offsets Policy	DAWE OMP template states offsets and offset proposal must:	How the principle is addressed by the offset:
1) Deliver an overall conservation outcome that improves or maintains the viability of the protected matter	- Improve or maintain the viability of the protected matter compared to what it would have been under the status quo (i.e. no action and no offset), resulting in No Net Loss or a Net Gain for the protected matter (refer to Section 3.1) - Be like-for like; achieve a positive conservation outcome for the same protected matter as being impacted, and the same attribute (e.g. habitat type) or one of better conservation value. If this is not able to be achieved, then the proposed impact may be deemed unacceptable. - Evidence that the protected matter is either on the offset site, or adjacent to (with connecting habitat/vegetation) and likely to inhabit the offset site once management makes it suitable for the matter - Be implemented for the duration of the impact (not just the action itself) - Not support or recreate non-endemic vegetation or ecosystems - Commit to a future quality that is equal to, or greater than, the quality of the impact site to be attained by the nominated time until ecological benefit and then maintained at for the duration of the impact (direct offsets only)	- The offset will result in a gain in legal protection of habitat, improvement in habitat quality and active control and elimination of key threats to each MNES species. - The offset site contains suitable habitat for each MNES. As such, this is a like-for-like solution. There will be a net increase in the protection of each MNES and its habitat, along with other benefits such as improved habitat connectivity and reduction of threats. - In particular, the offset site has been selected on the basis that forest red gum (<i>Eucalyptus tereticornis</i>) is a dominant canopy species in the site. Vegetation communities that contain forest red gum are recognised (among others) as an important winter and foraging resource for grey-headed flying-fox (DAWE 2021). - The proposed offset site has also been selected on the basis it provides an opportunity to improve connectivity between isolated patches of remnant vegetation, along the Tingalpa and Burhot riparian corridors and Don and Christine Burnett Conservation Area which is located immediately to the southwest of the site. - As detailed in the Preliminary Documentation, direct and indirect evidence if MNES have been recorded present in and within close proximity of the offset site. Section 5.0 details how the offset site contains suitable habitat for each of these species. - The offset will be managed to achieve the specified offset outcomes, such as protection and improvement of foraging and breeding habitat, to support self-sustaining MNES populations.



Principles of the Offsets Policy	DAWE OMP template states offsets and offset proposal must:	How the principle is addressed by the offset:
		- The offset site will be protected through being declared as an area of high nature conservation value under the <i>Vegetation Management Act 1999</i>, section 19F (registered on the land title). - The offset will not involve the use of any non-native vegetation or ecosystems. - As detailed in the Offsets Assessment Table for each species (Section 7.0), the future quality of the offset site will be at least equal to the quality of the impacted site within 20 years and then maintained into the future through registration on the land title.
2) Be built around direct offsets but can include other compensatory measures	- Be at least 90% direct offset - Direct offsets provide a measurable conservation gain for the impacted protected matter - Other compensatory measures must lead to benefits for the same aspect of the impacted protected matter - Address key threats and priority actions in relevant Recovery Plans, Threat Abatement Plans, Conservation/Listing Advice - Be legally secured for conservation purposes (i.e. protection mechanism that changes land tenure) for at least the duration of the impact if there is a risk of loss or degradation of the site without offset - The most secure and permanent protection mechanisms available should be used, and they should restrict activities not conducive to conservation of the protected matter	- The offset provides >100 % direct offset for Koala when combined with the other two offset sites. - The offset provides >100 % direct offset for GHFF when combined with the other two offset sites. - The offset provides >100 % direct offset for Greater Glider when combined with the other two offset sites. - As set out in the Offset Assessment Guide for each species (Section 8.0), the offset will provide a conservation gain for each matter. - Key threats have been reviewed from relevant national recovery plans and approved conservation advice. These have been incorporated into the offset outcomes, management actions and monitoring activities, as well as the performance criteria and corrective actions to be implemented. - The offset will be declared as an area of high nature conservation value under the <i>Vegetation Management Act 1999</i>, section 19, which is defined as a suitable mechanism under Section 29 of the <i>Queensland Environmental Offsets Act 2014</i>.
3) Be in proportion to the level of statutory protection that applies to the protected matter	Consider the accurate level of statutory protection (vulnerable, endangered or critically endangered) for the listed threatened species or ecological community	Relevant national recovery plans, approved conservation advice and species profiles and threats (SPRAT) have been reviewed for MNES conservation status which has been incorporated into the Offset Assessment Guide Calculator for each species (Section 8.0).



Principles of the Offsets Policy	DAWE OMP template states offsets and offset proposal must:	How the principle is addressed by the offset:
	this is achieved by selecting the correct category in the 'EPBC Act status' box of the Offsets Assessment Guide (Offsets Calculator). Note where a matter has been up-listed in the time since approval, the up-listed status is generally required to be used	
4) Be of a size and scale proportionate to the residual impacts on the protected matter	- Detail the attributes of the protected matter being impacted, the quality and importance of those attributes, the nature of the impact (e.g. permanent or temporary), the level of threat applicable to the offset site, the time it will take to achieve a conservation gain for the protected matter, and risk of the conservation gain not being realised. - Ensure that offsets calculations for threatened species and ecological communities are as accurate as possible and implement the Precautionary Principle where there is scientific uncertainty	MNES and habitat likely to be impacted by the Project will be offset by securing the offset site and improving the quality of the preferred habitat for each species. In addition, habitat secured has been assessed and strategically selected within the landscape-scale so that there is a net increase in connectivity for each MNES species. The net increase in habitat protection and connectivity, and therefore net gain, will be achieved within 20 years of commencement of the Plan.
5) Effectively account for and manage the risks of the offset not succeeding	- Consider the reduced risk of using direct offsets compared to other compensatory measures - Advanced offsets reduce this risk further - Include a risk analysis of factors that could affect the success of the offset (i.e. attain the completion criteria by the nominated time until ecological benefit and maintain this for the duration of the impact), with input from multiple environmental specialists - Assess the potential effectiveness of each management and corrective action (including for stochastic events), financial and business limitations, possible perverse outcomes from the offset, and any other potential limiting factors - Propose compensatory measures for if the offset fails, such as additional offsets to compensate for both the impact and failed offset - Details of how and when the Precautionary Principle has been applied	As detailed in Section 6.0, a risk analysis against the risk matrix has been used to assess the risk of the offset not succeeding. In addition to key threats that directly impact each MNES survival, appropriate management measures, monitoring and corrective actions are planned to help ensure that the offset provides a net benefit. Relevant national recovery plans, approved conservation advice, approved methodology for monitoring and controlling relevant threats have been reviewed and incorporated into the management actions, monitoring and corrective actions proposed in this OMP (see Section 2.0). These will prevent and reduce the likelihood of detrimental outcomes and this OMP identifies appropriate actions to implement should trigger criteria be exceeded.



Principles of the Offsets Policy	DAWE OMP template states offsets and offset proposal must:	How the principle is addressed by the offset:
6) Be additional to what is already required, determined by law of planning regulations, or agreed to under other schemes or programs	- Detail the duty of care requirements applicable to the offset site, such as the landowner's responsibility to control certain weeds and feral animals - Specify environmental planning laws that apply to the offset site (e.g. statutory protection of riparian areas) - conservation gains paid for, or achieved, while participating in other schemes (e.g. carbon offset scheme) - provide conservation gains that are in addition to duty of care, environmental planning laws or other schemes	- Prior to the offset, the landowner must meet the general biosecurity obligations under the Queensland <i>Biosecurity Act 2014</i> including preventing and minimising biosecurity risks. - Prior to the offset, the landowner has restricted vegetation clearing rights within areas mapped as remnant vegetation and high value regrowth under the Queensland <i>Vegetation Management Act 1999</i>. - However, the site is not currently subject to any specific environmental schemes or agreements (such as a previous offset agreement) and the land use restrictions imposed within the offset site will be additional to what is already required.
7) Be efficient, effective, timely, transparent, scientifically robust and reasonable	- Maintain or improve the viability of the protected matter through sound allocation of resources, including for any required management and monitoring of the offset - Be implemented before, or at the same time as, the impact occurring - Be based on scientifically robust and verifiable information, including best-practice surveys undertaken by suitably qualified experts - All supporting evidence must be provided to the DAWE, and any assumptions or limitations must be specified - The Precautionary Principle must be implemented if there is not scientific certainty - Use scientifically robust and peer-reviewed methods for collecting and analysing environmental data - Have realistic offset commitments and completion criteria that are likely to be achieved despite any potential threats or risks	- Maintenance and monitoring requirements are explicitly outlined in this OMP to achieve a net benefit for each MNES species so that self-sustaining populations are supported and will persist post the implementation of this OMP. - The offset site will be established with key risks for all MNES species controlled (including domestic livestock and pest animal exclusion fencing) prior to implementing other management and monitoring activities. - Management actions will commence at the offset site prior to construction. - The results of monitoring programs assessing the success of this OMP against key completion criteria will be provided to the DAWE as outlined in this OMP. - Proposed methodologies and schedule for management actions and monitoring activities outlined in this OMP have been peer-reviewed by a suitably qualified restoration ecologist. - This Plan incorporates feedback from peer-review and includes realistic and achievable completion criteria and timeframes.
8) Have transparent governance arrangements including being	Detail governance of the offset site, including ensuring that offset actions are fully funded for the required timeframe	Implementation of the OMP will be overseen by Karreman Quarries during the construction and operation of the Project. Funding of the



Principles of the Offsets Policy	DAWE OMP template states offsets and offset proposal must:	How the principle is addressed by the offset:
able to be readily measured, monitored, audited and enforced	• Commitments to measure and monitor the performance of the offset, and report on this annually to the DAWE • As appropriate, be delivered through contractual arrangements with a third party • Ensure that offset commitments are measurable and specific so that they can be audited and enforced	offset, including management and monitoring, will occur as part of delivery of the Project. • Auditable performance and completion criteria are stated in this OMP to assess overall offset success, monitoring and site maintenance actions and further actions are provided where trigger values are exceeded. • Corrective actions (activated by trigger criteria exceedances) are explicitly stated to address any inadequate outcomes.

Offset - Koala (*Phascolarctos cinereus*)

Assessment Unit - Regional Ecosystem		Offset 1																																																			
Site Reference		AU 1 - RE 12.11.24															AU 2 - 12.11.24															AU 3 - 12.3.11																					
Site Condition		Benchmark 12.11.24		Site 7			Site 8			Site 9			Average Score		Maximum Score		Benchmark 12.11.24		Site 2			Site 3			Site 4			Site 6			Average Score		Maximum Score		Benchmark 12.3.11		Site 1			Site 5			Average Score		Maximum Score								
				Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score					Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score					Raw Data	% Benchm	Score	Raw Data	% Benchm	Score															
Large trees (euc plus non-euc)	33	0	0	0	0	0	0	0	0	0	0	0	0.00	15			33	116	352	15	4	12	5	28	85	10	142	430	15	11.25	15		58	174	300	15	120	207	15	15	5	15	15										
Tree canopy height (average of emergent, canopy, sub-canopy)	NA	NA	NA	3	NA	NA	3	NA	NA	3	3	3.00	5				NA	NA	NA	5	NA	NA	5	NA	NA	5	NA	NA	5	5	5		NA	NA	NA	5	NA	NA	NA	3.5	4.25	5	5	5									
Recruitment of woody perennial species in EDL	100	50	50	3	27	27	3	43	43	3	3	3.00	5				100	69	69	3	61	61	3	85	85	5	71	71	3	3.5	5		100	100	100	5	43	43	3	4	5	5	5	5									
Tree canopy cover (average of emergent, canopy, sub-canopy)	NA	NA	NA	3.5	NA	NA	2	NA	NA	1	2.17	5					NA	NA	NA	3.5	NA	NA	3	NA	NA	3.5	NA	NA	3	3.875	5		NA	NA	NA	5	NA	NA	NA	5	NA	NA	NA	5	5	5							
Shrub canopy cover	7	1.5	21	3	17	16	3	0	0	0	2.00	5					7	9.5	136	5	3.3	47	3	1.4	20	3	0	0	2.75	5		13	7.5	58	5	0	0	0	2.5	5	5	5	5	5									
Coarse woody debris	546	0	0	0	0	0	0	0	0	0	0.00	5					546	955	175	5	300	55	5	625	114	5	475	87	5	5	5		555	160	29	3	440	79	5	4	5	5	5	5									
Native plant species richness - trees	10	13	130	5	11	110	5	14	140	5	5.00	5					10	17	170	5	13	130	5	14	140	5	14	140	5	5	5		7	22	314	5	16	229	5	5	5	5	5	5	5								
Native plant species richness - shrubs	8	4	50	2.5	5	63	2.5	2	25	2.5	2.50	5					8	4	50	2.5	6	75	2.5	6	75	2.5	9	113	5	3.125	5		7	12	171	5	8	114	5	5	5	5	5	5	5								
Native plant species richness - grasses	9	2	22	0	3	33	2.5	6	67	2.5	1.67	5					9	7	78	2.5	4	44	2.5	2	22	0	2	22	0	1.25	5		12	3	25	2.5	1	8	0	1.25	5	5	5	5	5								
Native plant species richness - forbes	17	8	47	2.5	8	47	2.5	4	24	0	1.67	5					17	7	41	2.5	19	112	5	19	112	5	15	88	2.5	3.75	5		25	10	40	2.5	19	76	2.5	2.5	5	5	5	5	5								
Non-native plant cover	0	60	0	0	60	0	70	0	0	0.00	10	0					0	2	10	0.2	10	3	20	0	3	20	0	3	20	0	7	10	0	40	3	75	0	1.5	10	5	5	5	5	5	5								
Native grass cover	39	9.4	24	1	3	8	0	11	28	1	0.67	5					39	32.6	84	3	9.2	24	1	2	5	0	2.2	6	0	1	5		44	3	7	0	7	16	1	0.5	5	5	5	5	5								
Organic litter	45	27.2	60	5	5	11	3	41.8	93	5	4.33	5					45	60.6	135	5	78.2	174	5	81	180	5	77.6	172	5	5	5		37	49	132	5	49.6	134	5	5	5	5	5	5	5								
Quality and availability of food and foraging habitat	10	5	5	5	5	5	5	5	5	5.00	10	10					10	5	5	5	5	5	5	5	5	5	5	5	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10							
Quality and availability of shelter habitat	10	10	10	10	10	10	10	10	10	1.00	10	10					10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10					
MAX Site Condition Score												100																		100														100									
Score for sampling site				34.5				32.5				29.0								82.0				72.0				67.0			69.0						81.0				70.0							75.5					
Score for assessment unit													32.0																		72.5																						
Score for the site													0.96																																								
(converted to) Site Condition Score - out of 3																																																					
Site Context																																																					
Size of patch	10			10			10			10			10.00	10			10			10			10			10			10			10			10			10			10			10			10			10			10
Connectedness	5			5			5			5			5.00	5			5			5			5			5			5			5			5			5			5			5			5			5			
Context	5			4			4			4			4.00	5			5			4			4			4			4			4			4			4			4			4			4			4			
Ecological Corridors	5			6			6			6			6.00	6			6			6			6			6			6			6			6			6			6			6			6			6			
Role of site location to species overall population in the state	5			5			5			5			5.00	5			5			5			5			5			5			5			5			5			5			5			5			5			
Threats to the species	15			7			7			7			7.00	15			15			7			7			7			7			7			7			7			7			7			7			7			
Species mobility capacity	10			5			5			5			5.00	10			10			10			10			10			10			10			10			10			10			10			10			10			10
MAX Site Context Score												56																				56																					
Score for sampling site				42.0			42.0			42.0			42.0							47.0			47.0			47.0			47.0			47.0					42.0			42.0			42.0			42.0			42.0				
Score for assessment unit													42.0																																								
Score for the site																																																					
(converted to) Site Context Score - out of 3																																																					
2.25																																																					

Species Stocking Rate (SSR)	Scoring Table - AU1						Score assigned
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5		10		10
		No	Yes -		Yes - on-		
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15		15
		Not habitat	Dispersal	Foraging	Breeding		
Approximate density (per ha)	Score	0	10	20	30		20
		0%					
Role/importance of species population on site*	Score	0	5	10		15	0
		0	5 - 15	20 - 35		40 - 45	
	Total SSR score - (converted to)						45
							2.57

Scoring Table					Score assigned
Score	0	5		10	10
	No	Yes -		Yes - on-site	
Score	0	5	10	15	15
	Not habitat	Dispersal	Foraging	Breeding	
Score	0	10	20	30	20
	0%				
Score	0	5	10		15
	0	5 - 15	20 - 35		40 - 45
Total SRR score (converted to)					45
					2.57

Scoring Table						Score assigned
Score	0	5		10		10
	No	Yes -		Yes - on-		
Score	0	5	10	15		15
	Not habitat	Dispersal	Foraging	Breeding		
Score	0	10	20	30		20
	0%					
Score	0	5	10		15	0
	0	5 - 15	20 - 35		40 - 45	
Total SRR score - (converted to)						45 2.57

*SSR Supplementary Table	Scoring table			Score assigned
	Score	0	10	
*Key source population for breeding		No	Yes/ Possibly	
*Key source population for dispersal	Score	0	5	
		No	Yes/ Possibly	
*Necessary for maintaining genetic diversity	Score	0	15	
		No	Yes/ Possibly	
*Near the limit of the species range	Score	0	15	
		No	Yes	
	Total for SSR Supplementary Table			

Scoring table			Score assigned
Score	0	10	
	No	Yes/ Possibly	
Score	0	5	
	No	Yes/ Possibly	
Score	0	15	
	No	Yes/ Possibly	
Score	0	15	
	No	Yes	
Total for SSR Supplementary Table			

Scoring table			Score assigned
Score	0	10	
	No	Yes/ Possibly	
Score	0	5	
	No	Yes/ Possibly	
Score	0	15	
	No	Yes/ Possibly	
Score	0	15	
	No	Yes	
Total for SSR Supplementary Table			

				48.81
Final habitat quality score (weighted)	AU1	AU2	AU3	
Site Condition score (out of 3)	0.96	2.18	2.27	
Site Context Score (out of 3)	2.25	2.52	2.25	
Species Stocking Rate Score (out of 4)	2.57	2.57	2.57	
Habitat Quality score - out of 10	5.78	7.26	7.09	
Offset Site Average				6.71
Assessment Unit Area	28.27	16.26	4.28	
Total Offset Area (ha) for MNES	48.81	48.81	48.81	
Site weighting	0.58	0.33	0.09	
AU Weighted Habitat Quality	3.35	2.42	0.62	
Site Weighted Habitat Quality				6.39

Offset - Grey-headed Flying-fox (Pteropus poliocephalus)

47.45

4.45		Offset 1																																											
Assessment Unit - Regional Ecosystem		AU 1 - RE 12.11.24												AU 2 - 12.11.24												AU 3 - 12.3.11																			
Site Reference	Benchmark	Site 7				Site 8				Site 9				Average	Maximum	Benchmark	Site 2				Site 3				Site 4				Site 6				Average	Maximum	Benchmark	Site 1				Site 5				Average	Maximum
Site Condition	12.11.24	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Average	Score	12.11.24	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Average	Score	12.11.24	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Average	Score						
Large trees (euc plus non-euc)	33	0	0	0	0	0	0	0	0	0	0.00	15	33	116	352	15	4	12	5	28	85	5	10	142	430	15	11.25	15	58	174	300	15	120	207	15	15	15								
Tree canopy height (average of emergent, canopy, sub-canopy)	NA	NA	NA	3	NA	NA	3	NA	NA	3	3.00	5	NA	NA	NA	5	NA	NA	5	NA	NA	5	NA	NA	5	5	5	NA	NA	NA	5	NA	NA	3.5	4.25	5	5	5							
Recruitment of woody perennial species in EDL	100	50	50	3	27	27	3	43	43	3	3.00	5	100	69	69	3	61	61	3	85	85	5	71	71	3	3	5	100	100	100	5	43	43	3	4	5	5								
Tree canopy cover (average of emergent, canopy, sub-canopy)	NA	NA	NA	3.5	NA	NA	2	NA	NA	1	2.17	5	NA	NA	NA	3.5	NA	NA	5	NA	NA	3.5	NA	NA	3.5	3.875	5	NA	NA	NA	5	NA	NA	5	5	5	5								
Shrub canopy cover	7	1.5	21	3	1.1	16	3	0	0	0	2.00	5	7	9.5	136	5	3.3	47	3	1.4	20	3	0	0	0	2.75	5	13	7.5	58	5	0	0	0	2.5	5	5								
Coarse woody debris	546	0	0	0	0	0	0	0	0	0	0.00	5	546	955	175	5	300	55	5	625	114	5	475	87	5	5	5	555	160	29	3	440	79	5	4	5	5								
Native plant species richness - trees	10	15	130	5	11	110	5	14	140	5	5.00	5	10	17	170	5	13	130	5	14	140	5	14	140	5	5	5	7	22	314	5	16	228	5	5	5	5								
Native plant species richness - shrubs	8	4	50	2.5	5	63	2.5	2	25	2.5	2.50	5	8	4	50	2.5	6	75	2.5	6	75	2.5	9	113	5	3.125	5	7	12	171	5	8	114	5	5	5	5								
Native plant species richness - grasses	9	2	22	0	3	33	2.5	6	67	2.5	1.67	5	9	7	78	2.5	4	44	2.5	2	22	0	2	22	0	1.25	5	12	3	25	2.5	1	8	0	1.25	5	5								
Native plant species richness - forbes	17	8	47	2.5	8	47	2.5	4	24	0	1.67	5	17	7	41	2.5	19	112	5	19	112	5	15	88	2.5	3.75	5	25	10	40	2.5	19	76	2.5	2.5	5	5								
Non-native plant cover	0	60	0	60	0	60	0	70	0	0.00	10	0	0	2	10	0.2	10	30	3	20	5	7	10	5	7	10	0	40	3	75	0	0	1.5	10	10	10									
Native grass cover	39	9.4	24	1	3	8	0	11	28	1	0.67	5	39	32.6	84	3	9.2	24	1	2	5	0	2.2	6	0	1	5	44	3	7	0	7	16	1	0.5	5	5								
Organic litter	45	27.2	60	5	5	11	3	41.8	93	5	4.33	5	45	60.6	135	5	78.2	174	5	81	180	5	77.6	172	5	5	5	37	49	132	5	49.6	134	5	5	5	5								
Quality and availability of food and foraging habitat	10			1			1			1	1.00	10	10			5			5			5			5	5	5	10			5			5	5	10	10								
(Quality and availability of shelter habitat) NA												90																										90							
MAX Site Condition Score				29.5			27.5				24.0					72.0			62.0				57.0			59.0		62.5				66.0			55.0		60.5								
Score for assessment unit											27.0																																		
Score for the site											2.10															4.86										4.71									
(converted to) Site Condition Score - out of 7																																													
Site Context																																													
Size of patch	10			10			10			10	10.00	10	10			10			10			10			10	10	10	10			10			10	10	10	10	10							
Connectedness	5			4			4			4	4.00	5	5			5			5			5			5	5	5	5			5			5	5	5	5								
Context	5			4			4			4	4.00	5	5			4			4			4			4	4	5	5			4			4	4	5	5								
Ecological Corridors	6			6			6			6	6.00	6	6			6			6			6			6	6	6	6			6			6	6	6	6								
Role of site location to species overall population in the state	5			5			5			5	5.00	5	5			5			5			5			5	5	5	5			5			5	5	5	5								
Threats to the species	15			15			15			15	15.00	15	15			15			15			15			15	15	15	15			15			15	15	15	15								
Species mobility capacity	10			10			10			10	10.00	10	10			10			10			10			10	10	10	10			10			10	10	10	10								
MAX Site Context Score												56															56										56								
Score for sampling site				54.0			54.0				54.0								0.0			0.0			0.0		55.0							55.0			55.0								
Score for assessment unit																																													
Score for the site											2.89															2.95										2.95									
(converted to) Site Context Score - out of 3																																													

	48.81		
	Offset 1		
Final habitat quality score (weighted)	AU1	AU2	AU3
Site Condition score (out of 7)	2.10	4.86	4.71
Site Context Score (out of 3)	2.89	2.95	2.95
Species Stocking Rate Score (NA)			
Habitat Quality score - out of 10	4.99	7.81	7.65
Offset Site Average			6.92
Assessment Unit Area	28.27	16.26	4.28
Total Offset Area (ha) for MNES	48.81	48.81	48.81
Size weighting	0.58	0.33	0.09
AU Weighted Habitat Quality	2.89	2.60	0.67
Site Weighted Habitat Quality			6.16

Offset - Greater Glider (*Petauroides volans*)

Assessment Unit - Regional Ecosystem		Offset 1																																			
Site Reference	Benchmark	AU 1 - RE 12.11.24								AU 2 - 12.11.24																AU 3 - 12.3.11											
Site Condition	12.11.24	Site 7		Site 8		Site 9		Average Score	Maximum Score	Benchmark	Site 2		Site 3		Site 4		Site 6		Average Score	Maximum Score	Benchmark	Site 1		Site 5		Average Score	Maximum Score										
		Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score									
Large trees (euc plus non-euc)	33	0	0	0	0	0	0	0	0	0	0.00	15	33	116	352	15	4	12	5	28	85	10	142	430	15	11.25	15	58	174	300	15	120	207	15	15	15	
Tree canopy height (average of emergent, canopy, sub-canopy)	NA	NA	NA	3	NA	NA	3	NA	NA	3	3.00	5	NA	NA	NA	5	NA	NA	NA	5	NA	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	3.5	4.25	5	5	5	
Recruitment of woody perennial species in EDL	100	50	50	3	27	27	3	43	43	3	3.00	5	100	69	69	3	61	61	3	85	85	5	71	71	3	3.5	5	100	100	100	5	43	43	3	4	5	
Free canopy cover (average of emergent, canopy, sub-canopy)	NA	NA	NA	3.5	NA	NA	2	2.17	5	NA	NA	NA	3.5	NA	NA	NA	3.5	NA	NA	NA	3.5	NA	NA	NA	5	NA	NA	5	NA	NA	5	NA	NA	5	5	5	
Shrub canopy cover	7	1.5	1.5	3	1.1	16	3	0	0	0	0	5	7	9.5	136	5	3.3	47	3	2.00	5	0	0	0	0	0	0	13	75	58	5	0	0	0	2.5	5	
Coarse woody debris	546	0	0	0	0	0	0	0	0	0	0.00	5	546	955	175	5	300	55	5	625	114	5	475	87	5	5	5	555	160	29	3	440	79	5	4	5	
Native plant species richness - trees	10	13	130	5	11	110	5	14	140	5	5.00	5	10	17	170	5	13	130	5	14	140	5	14	140	5	5	5	7	22	314	5	16	229	5	5	5	
Native plant species richness - shrubs	8	4	50	2.5	5	63	2.5	2	25	2.5	2.50	5	8	4	50	2.5	6	75	2.5	6	75	2.5	9	113	5	3.125	5	7	12	171	5	8	114	5	5	5	
Native plant species richness - grasses	9	2	22	0	3	33	2.5	6	67	2.5	1.67	5	9	7	78	2.5	4	44	2.5	2	22	0	2	22	0	1.25	5	12	3	25	2.5	1	8	0	1.25	5	
Native plant species richness - forbes	17	8	47	2.5	8	47	2.5	4	24	0	1.67	5	17	7	41	2.5	19	112	5	19	112	5	15	88	2.5	3.75	5	25	10	40	2.5	19	76	2.5	2.5	5	
Non-native plant cover	0	60		0	60		0	70		0	0.00	10	0	2		10	0.2	10	30		3	20		5	7		7	10	0	40	3	75		0	1.5	10	
Native grass cover	39	9.4	24	1	3	8	0	11	28	1	0.67	5	39	32.6	84	3	9.2	24	1	2	5	0	2.2	6	0	1	5	44	3	7	0	7	16	1	0.5	5	
Organic litter	45	27.2	60	5	5	11	3	41.8	93	5	4.33	5	45	60.6	135	5	78.2	174	5	81	180	5	77.6	172	5	5	5	37	49	132	5	49.6	134	5	5	5	
Quality and availability of food and foraging habitat	10			5						5	5.00	10	10			5				5		5		5		5	10	10		10		10		10	10	10	
Quality and availability of shelter habitat	10			1						1	1.00	10	10			1				1		1		10		3.25	10	10		10		10		10	10	10	
MAX Site Condition Score												100															100									100	
Score for sampling site				34.5			32.5			29.0						73.0				63.0			58.0			69.0						81.0			70.0		
Score for assessment unit											32.0															65.8									75.5		
Score for the site																																					
(converted to) Site Condition Score - out of 3											0.96																										
Site Context																																					
Size of patch	10			10			10		10	10.00	10		10			10			10		10					10	10	10	10			10		10	10	10	10
Connectedness	5			5			5		5	5.00	5		5			5			5		5				5	5	5	5			5		5	5	5	5	
Context	4			4			4		4	4.00	5		5			4			4		4			4	4	5	5	5	5			4		4	4	5	5
Ecological Corridors	6			6			6		6	6.00	6		6			6			6		6			6	6	6	6	6	6			6		6	6	6	6
Role of site location to species overall population in the state	5			5			5		5	5.00	5		5			5			5		5			5	5	5	5	5	5			5		5	5	5	5
Threats to the species	15			7			7		7	7.00	15		15			7			7		7			7	7	15	15	15	15			7		7	7	15	15
Species mobility capacity	10			5			5		5	5.00	10		10			10			10		10			10	10	10	10	10	10			5		5	5	10	10
MAX Site Context Score											56																56									56	
Score for sampling site				42.0			42.0			42.0						47.0				47.0			47.0			47.0							42.0		42.0		
Score for assessment unit											42.0																47.0									42.0	
Score for the site																																					
(converted to) Site Context Score - out of 3											2.25																									2.25	

Species Stocking Rate (SSR)	Scoring Table - AU1					Score assigned
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5	10		5
		No	Yes -	Yes - on-		
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15	10
		Not habitat	Dispersal	Foraging	Breeding	
Approximate density (per ha)	Score	0	10	20	30	0
		0%	5	10		
Role/importance of species population on site*	Score	0	5	10	15	0
		0	5 - 15	20 - 35	40 - 45	
	Total SSR score - (converted to)					15 0.86

Scoring Table					Score assigned
Score	0	5		10	5
	No	Yes -		Yes - on-site	
Score	0	5	10	15	10
	Not habitat	Dispersal	Foraging	Breeding	
Score	0	10	20	30	0
	0%				
Score	0	5	10		15
	0	5 - 15	20 - 35		40 - 45
Total SRR score (converted to)					15 0.86

Scoring Table					Score assigned
Score	0	5		10	
	No	Yes -		Yes - on-	
Score	0	5	10	15	15
	Not habitat	Dispersal	Foraging	Breeding	
Score	0	10	20	30	0
	0%				
Score	0	5	10		15
	0	5 - 15	20 - 35		40 - 45
Total SRR score - (converted to)					20
					1.14

SSR Supplementary Table	Scoring table			Score assigned
	Score	0	10	
*Key source population for breeding		No	Yes/ Possibly	
	Score	0	5	
*Key source population for dispersal		No	Yes/ Possibly	
	Score	0	15	
*Necessary for maintaining genetic diversity		No	Yes/ Possibly	
	Score	0	15	
*Near the limit of the species range		No	Yes	
	Total for SSR Supplementary Table			

Scoring table			Score assigned
Score	0	10	
	No	Yes/ Possibly	
Score	0	5	
	No	Yes/ Possibly	
Score	0	15	
	No	Yes/ Possibly	
Score	0	15	
	No	Yes	
Total for SSR Supplementary Table			

Scoring table			Score assigned
Score	0	10	
	No	Yes/ Possibly	
Score	0	5	
	No	Yes/ Possibly	
Score	0	15	
	No	Yes/ Possibly	
Score	0	15	
	No	Yes	
Total for SSR Supplementary Table			

48.81

Final habitat quality score (weighted)	Offset 1		
	AU1	AU2	AU3
Site Condition score (out of 3)	0.96	1.97	2.27
Site Context Score (out of 3)	2.25	2.52	2.25
Species Stocking Rate Score (out of 4)	0.86	0.86	1.14
Habitat Quality score - out of 10	4.07	5.35	5.66
Offset Site Average			5.02
Assessment Unit Area	28.27	16.26	4.28
Total Offset Area (ha) for MNES	48.81	48.81	48.81
Size weighting	0.58	0.33	0.09
AU Weighted Habitat Quality	2.36	1.78	0.50
Site Weighted Habitat Quality			4.63

Post Offset - Koala (Phascolarctos cinereus)

		Offset 1																																		
Assessment Unit - Regional Ecosystem		AU 1 - RE 12.11.24												AU 2 - 12.11.24												AU 3 - 12.3.11										
Site Reference		Site 7		Site 8		Site 9		Average Score		Maximum Score		Site 2		Site 3		Site 4		Site 6		Average Score		Maximum Score		Site 1		Site 5		Average Score		Maximum Score						
Site Condition		Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Average Score	Maximum Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Average Score	Maximum Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Average Score	Maximum Score					
12.11.24		33	17	51	10	17	51	10	33	51	10	10.00	15	33	33	100	15	33	33	100	15	33	33	100	15	142	75	430	15	15	15					
Large trees (euc plus non-euc)		NA	NA	NA	5	NA	NA	5	NA	NA	5	5.00	5	NA	NA	N	5	NA	N	5	5	5	NA	NA	NA	5	58	80	138	15	102	176	15	15	15	
Tree canopy height (average of emergent, canopy, sub-canopy)		100	76	76	5	76	76	5	76	76	5	5.00	5	100	76	76	5	76	76	5	5	5	100	76	76	5	76	76	5	5	5	5	5	5	5	5
Recruitment of woody perennial species in EDL		NA	NA	NA	5	NA	NA	5	NA	NA	5	5.00	5	NA	NA	NA	5	NA	NA	5	5	5	NA	NA	NA	5	NA	NA	5	5	5	5	5	5	5	
Tree canopy cover (average of emergent, canopy, sub-canopy)		7	7	100	5	7	100	5	7	100	5	5.00	5	7	9.5	136	5	7	100	5	5	5	7	100	5	5	13	7.5	58	5	13	100	5	5	5	
Shrub canopy cover		546	546	100	5	546	100	5	546	100	5	5.00	5	546	955	175	5	300	55	5	5	5	546	475	87	5	555	555	100	5	440	79	5	5	5	
Coarse woody debris		10	13	130	5	11	110	5	14	140	5	5.00	5	10	17	170	5	13	130	5	5	5	14	140	5	5	7	22	314	5	16	229	5	5	5	
Native plant species richness - trees		8	8	100	5	8	100	5	8	100	5	5.00	5	8	4	50	5	6	75	5	5	5	9	113	5	5	7	12	171	5	8	114	5	5	5	
Native plant species richness - shrubs		9	9	100	5	9	100	5	9	100	5	5.00	5	9	7	78	5	4	44	5	5	5	2	22	5	5	12	3	25	5	1	8	5	5	5	
Native plant species richness - grasses		17	17	100	5	17	100	5	17	100	5	5.00	5	17	7	41	5	19	112	5	5	5	15	88	5	5	25	10	40	5	19	76	5	5	5	
Native plant species richness - forbes		0	4		10	4		10	4		10	10.00	10	0	2		10	0.2		10	4		10	4		10	0	4		7	10	4	10	10	10	
Non-native plant cover		39	39	100	5	39	100	5	39	100	5	5.00	5	39	32.6	84	5	9.2	24	5	5	5	2.2	6	5	5	44	3	7	5	7	16	5	5	5	
Native grass cover		45	45	100	5	45	100	5	45	100	5	5.00	5	45	60.6	135	5	78.2	174	5	5	5	81	180	5	5	37	49	132	5	49.6	134	5	5	5	
Organic litter		10			10			10			10	10.00	10	10			10			10			10			10			10			10	10	10	10	10
Quality and availability of food and foraging habitat		10			10			10			10	10.00	10	10			10			10			10			10			10			10	10	10	10	10
Quality and availability of shelter habitat		10			10			10			10	10.00	10	10			10			10			10			10			10			10	10	10	10	10
MAX Site Condition Score												100																							100	
Score for sampling site					95.0			95.0			95.0					100.0																			100	
Score for assessment unit											95.0																								100.0	
Score for the site																																				
(converted to) Site Condition Score - out of 3											2.85																								3.00	
Site Context																																				
Size of patch		10			10			10			10.00	10	10			10			10			10			10			10			10		10	10	10	
Connectedness		5			4			4			4.00	5	5			5			5			5			5			5			5		5	5		
Context		5			4			4			4.00	5	5			4			4			4			4			4			4		4	4		
Ecological Corridors		6			6			6			6.00	6	6			6			6			6			6			6			6		6	6		
Role of site location to species overall population in the state		5			5			5			5.00	5	5			5			5			5			5			5			5		5	5		
Threats to the species		15			7			7			7.00	15	15			7			7			7			7			7			7		15	15		
Species mobility capacity		10			10			10			10.00	10	10			10			10			10			10			10			10		10	10	10	
MAX Site Context Score												56																							56	
Score for sampling site					46.0			46.0			46.0					47.0																			47.0	
Score for assessment unit																																			47.0	
Score for the site																																				
(converted to) Site Context Score - out of 3											2.46																								2.52	

Species Stocking Rate (SSR)	Scoring Table - AU1					Score assigned
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5		10	10
		No	Yes -	Yes - on-site		
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15	15
		Not habitat	Dispersal	Foraging	Breeding	
Approximate density (per ha)	Score	0	10	20	30	20
		0%				
Role/importance of species population on site*	Score	0	5	10	15	
		0	5 - 15	20 - 35	40 - 45	
Total SRR score - (converted to)						45
						2.57

*SSR Supplementary Table	Scoring table		Score assigned
*Key source population for breeding	Score	0	10
		No	Yes/ Possibly
*Key source population for dispersal	Score	0	5
		No	Yes/ Possibly
*Necessary for maintaining genetic diversity	Score	0	15
		No	Yes/ Possibly
*Near the limit of the species range	Score	0	15
		No	Yes
Total for SSR Supplementary Table			

	Offset 1		
	AU1	AU2	AU3
Final habitat quality score (weighted)			
Site Condition score (out of 3)	2.85	3.00	3.00
Site Context Score (out of 3)	2.46	2.52	2.52
Species Stocking Rate Score (out of 4)	2.57	2.57	2.57
Habitat Quality score - out of 10	7.89	8.09	8.09
Offset Site Average			8.03
Assessment Unit Area	28.27	16.26	4.28
Total Offset Area (ha) for MNES	48.81	48.81	48.81
Size weighting	0.58	0.33	0.09
AU Weighted Habitat Quality	4.57	2.69	0.71
Site Weighted Habitat Quality			7.97

Scoring Table					Score assigned
Score	0	5		10	10
	No	Yes -	Yes - on-site		
Score	0	5	10	15	15
	Not habitat	Dispersal	Foraging	Breeding	
Score	0	10	20	30	20
	0%				
Score	0	5	10	15	
	0	5 - 15	20 - 35	40 - 45	
Total SRR score - (converted to)					45
					2.57

Scoring table		Score assigned
Score	0	10
	No	Yes/ Possibly
Score	0	5
	No	Yes/ Possibly
Score	0	15
	No	Yes/ Possibly
Score	0	15
	No	Yes
Total for SSR Supplementary Table		

Scoring Table					Score assigned
Score	0	5		10	10
	No	Yes -	Yes - on-site		
Score	0	5	10	15	15
	Not habitat	Dispersal	Foraging	Breeding	
Score	0	10	20	30	20
	0%				
Score	0	5	10	15	0
	0	5 - 15	20 - 35	40 - 45	
Total SRR score - (converted to)					45
					2.57

Scoring table		Score assigned
Score	0	10
	No	Yes/ Possibly
Score	0	5
	No	Yes/ Possibly
Score	0	15
	No	Yes/ Possibly
Score	0	15
	No	Yes
Total for SSR Supplementary Table		

Post offset - Grey-headed Flying-fox (Pteropus poliocephalus)
47.45

4.45	Offset 1																																				
Assessment Unit - Regional Ecosystem	AU 1 - RE 12.11.24												AU 2 - 12.11.24												AU 3 - 12.3.11												
Site Reference	Benchmark	Site 7			Site 8			Site 9			Average	Maximum	Benchmark	Site 2			Site 3			Site 4			Site 6			Average	Maximum	Benchmark	Site 1			Site 5			Average	Maximum	
Site Condition	12.11.24	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Score	Score	12.11.24	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Score	Score	12.3.11	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Score	Score	
Large trees (euc plus non-euc)	33	17	51	10	17	51	10	33	51	10	15.00	15	33	33	100	15	33	100	15	33	100	15	142	430	15	15	15	58	80	138	15	102	176	15	15	15	
Tree canopy height (average of emergent, canopy, sub-canopy)	NA	NA	NA	5	NA	NA	5	NA	NA	5	5.00	5	NA	NA	N	5	NA	N	5	NA	N	5	NA	N	5	5	5	NA	NA	NA	5	NA	NA	5	5	5	
Recruitment of woody perennial species in EDL	100	100	100	5	100	100	5	100	100	5	5.00	5	100	76	76	5	76	76	5	76	76	5	76	76	5	5	5	100	76	76	5	76	76	5	5	5	
Tree canopy cover (average of emergent, canopy, sub-canopy)	NA	NA	NA	5	NA	NA	5	NA	NA	5	5.00	5	NA	NA	NA	5	NA	NA	5	NA	NA	5	NA	NA	5	5	5	NA	NA	NA	5	NA	NA	5	5	5	
Shrub canopy cover	7	7	100	5	7	100	5	7	100	5	5.00	5	7	9.5	136	5	7	100	5	7	100	5	7	100	5	5	5	13	7.5	58	5	13	100	5	5	5	
Coarse woody debris	546	546	100	5	546	100	5	546	100	5	5.00	5	546	955	175	5	300	55	5	625	114	5	475	87	5	5	555	555	100	5	440	79	5	5	5		
Native plant species richness - trees	10	13	130	5	11	110	5	14	140	5	5.00	5	10	17	170	5	13	130	5	14	140	5	14	140	5	5	5	7	22	314	5	16	229	5	5	5	
Native plant species richness - shrubs	8	8	100	5	8	100	5	8	100	5	5.00	5	8	4	50	5	6	75	5	6	75	5	9	113	5	5	5	7	12	171	5	8	114	5	5	5	
Native plant species richness - grasses	9	9	100	5	9	100	5	9	100	5	5.00	5	9	7	78	5	4	44	5	2	22	5	2	22	5	5	5	12	3	25	5	1	8	5	5	5	
Native plant species richness - forbes	17	17	100	5	17	100	5	17	100	5	5.00	5	17	7	41	5	19	112	5	19	112	5	15	88	5	5	5	25	10	40	5	19	76	5	5	5	
Non-native plant cover	0	4	10	4	10	4	10	4	10	10	10.00	10	0	2	10	0.2	10	4	10	4	10	4	10	4	10	10	10	0	4	10	4	10	4	10	10	10	
Native grass cover	39	39	100	5	39	100	5	39	100	5	5.00	5	39	32.6	84	5	9.2	24	5	2	5	5	2.2	6	5	5	5	44	3	7	5	7	16	5	5	5	
Organic litter	45	45	100	5	45	100	5	45	100	5	5.00	5	45	60.6	135	5	78.2	174	5	81	180	5	77.6	172	5	5	5	37	49	132	5	49.6	134	5	5	5	
Quality and availability of food and foraging habitat (Quality and availability of shelter habitat) NA	5			5			5			5	5.00	10	10			5			5			5			5	5	10	10		5			5		10		
MAX Site Condition Score												90															90									90	
Score for sampling site				80.0			80.0			80.0						85.0			85.0			85.0			85.0							85.0			85.0		
Score for assessment unit											85.0														85.0										85.0		
Score for the site																																					
(converted to) Site Condition Score - out of 3											6.61														6.61										6.61		
Site Context																																					
Size of patch	10			10			10			10	10.00	10	10			10			10			10			10	10	10	10			10			10	10	10	
Connectedness	5			4			4			4	4.00	5	5			5			5			5			5	5	5	5			5			5	5	5	
Context	5			4			4			4	4.00	5	5			4			4			4			4	4	5	5			4			4	4	5	
Ecological Corridors	6			6			6			6	6.00	6	6			6			6			6			6	6	6	6			6			6	6	6	
Role of site location to species overall population in the state	5			5			5			5	9.67	5	5			5			5			5			5	5	5	5			5			5	5	5	
Threats to the species	15			15			7			7	9.67	15	15			15			15			15			15	15	15	15			15			15	15	15	
Species mobility capacity	10			5			5			5	5.00	10	10			10			10			10			10	10	10	10			10			10	10	10	
MAX Site Context Score												56																56								56	
Score for sampling site				49.0			41.0			41.0						0.0			0.0			0.0			0.0												
Score for assessment unit											48.3														55.0										55.0		
Score for the site																																					
(converted to) Site Context Score - out of 3											2.59														2.95										2.95		

48.81			
Offset 1			
Final habitat quality score (weighted)	AU1	AU2	AU3
Site Condition score (out of 7)	6.61	6.61	6.61
Site Context Score (out of 3)	2.59	2.95	2.95
Species Stocking Rate Score (NA)			
Habitat Quality score - out of 10	9.20	9.56	9.56
Offset Site Average			9.44
Assessment Unit Area	28.27	16.26	4.28
Total Offset Area (ha) for MNES	48.81	48.81	48.81
Size weighting	0.58	0.33	0.09
AU Weighted Habitat Quality	5.33	3.18	0.84
Site Weighted Habitat Quality			9.35

Post Offset - Greater Glider (Petauroides volans)

		Offset 1																																				
Assessment Unit - Regional Ecosystem		AU 1 - RE 12.11.24												AU 2 - 12.11.24												AU 3 - 12.3.11												
Site Reference		Benchmark	Site 7			Site 8			Site 9			Average	Maximum	Benchmark	Site 2			Site 3			Site 4			Site 6			Average	Maximum	Benchmark	Site 1			Average	Maximum				
Site Condition		12.11.24	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Score	m Score	12.11.24	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Score	Score	12.3.11	Raw Data	% Benchm	Score	Raw Data	% Benchm	Score	Score	Score	
Large trees (euc plus non-euc)		33	17	51	10	17	51	10	33	51	10	10.00	15	33	33	100	15	33	100	15	33	100	15	142	430	15	15	15	58	80	138	15	102	176	15	15	15	
Tree canopy height (average of emergent, canopy, sub-canopy)		NA	NA	NA	5	NA	NA	5	NA	NA	5	5.00	5	NA	NA	N	5	NA	N	5	NA	N	5	NA	N	5	5	5	NA	NA	NA	5	NA	NA	5	5	5	
Recruitment of woody perennial species in EDL		100	76	76	5	76	76	5	100	76	76	5	5.00	5	100	76	76	5	76	76	5	76	76	5	76	76	5	5	5	100	76	76	5	76	76	5	5	5
Tree canopy cover (average of emergent, canopy, sub-canopy)		NA	NA	NA	5	NA	NA	5	NA	NA	5	5.00	5	NA	NA	NA	5	NA	NA	5	NA	NA	5	NA	NA	5	5	5	NA	NA	NA	5	NA	NA	5	5	5	
Shrub canopy cover		7	7	100	5	7	100	5	7	100	5	5.00	5	7	9.5	136	5	7	100	5	7	100	5	7	100	5	5	5	13	7.5	58	5	13	100	5	5	5	
Coarse woody debris		546	546	100	5	546	100	5	546	100	5	5.00	5	546	955	175	5	300	55	5	625	114	5	475	87	5	5	5	555	555	100	5	440	79	5	5	5	
Native plant species richness - trees		10	13	130	5	11	110	5	14	140	5	5.00	5	10	17	170	5	13	130	5	14	140	5	14	140	5	5	5	7	22	314	5	16	229	5	5	5	
Native plant species richness - shrubs		8	8	100	5	8	100	5	8	100	5	5.00	5	8	4	50	5	6	75	5	6	75	5	9	113	5	5	5	7	12	171	5	8	114	5	5	5	
Native plant species richness - grasses		9	9	100	5	9	100	5	9	100	5	5.00	5	9	7	78	5	4	44	5	2	22	5	2	22	5	5	5	12	3	25	5	1	8	5	5	5	
Native plant species richness - forbes		17	17	100	5	17	100	5	17	100	5	5.00	5	17	7	41	5	19	112	5	19	112	5	15	88	5	5	5	25	10	40	5	19	76	5	5	5	
Non-native plant cover		0	4		10	4		10	4		10	10.00	10	0	2		10	0.2		10	4		10	4		10	10	10	0	4		10	4		10	10	10	
Native grass cover		39	39	100	5	39	100	5	39	100	5	5.00	5	39	32.6	84	5	9.2	24	5	2		5	2.2	6	5	5	5	44	3	7	5	7	16	5	5	5	
Organic litter		45	45	100	5	45	100	5	45	100	5	5.00	5	45	60.6	135	5	78.2	174	5	81	180	5	77.6	172	5	5	5	37	49	132	5	49.6	134	5	5	5	
Quality and availability of food and foraging habitat		10			10			10			10	10.00	10	10			10			10			10			10	10	10	10			10			10	10	10	
Quality and availability of shelter habitat		10			10			10			10	10.00	10	10			10			10			10			10	10	10	10			10			10	10	10	
MAX Site Condition Score												100														100										100		
Score for sampling site					95.0			95.0			95.0						100.0			100.0						100.0										100.0		
Score for assessment unit												95.0														100.0										100.0		
Score for the site																																						
(converted to) Site Condition Score - out of 3												2.85														3.00										3.00		
Site Context																																						
Size of patch		10			10			10			10	10.00	10	10	10		10			10			10			10	10	10	10			10			10	10	10	
Connectedness		5			4			4			4	4.00	5	5			5			5			5			5	5	5	5			5			5	5		
Context		5			4			4			4	4.00	5	5			4			4			4			4	4	5	5			4			4	4	5	
Ecological Corridors		6			6			6			6	6.00	6	6			6			6			6			6	6	6	6			6			6	6		
Role of site location to species overall population in the state		5			5			5			5	5.00	5	5			5			5			5			5	5	5	5			5			5	5		
Threats to the species		15			7			7			7	7.00	15	15			7			7			7			7	7	15	15			7			7	15		
Species mobility capacity		10			10			10			10	10.00	10	10			10			10			10			10	10	10	10			10			10	10	10	
MAX Site Context Score												56															56									56		
Score for sampling site					46.0			46.0			46.0						47.0			47.0						47.0									47.0			
Score for assessment unit												46.0														47.0									47.0			
Score for the site																																						
(converted to) Site Context Score - out of 3												2.46														2.52										2.52		

Species Stocking Rate (SSR)	Scoring Table - AU1						Score assigned
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5		10		0
	No	Yes -			Yes - on-		
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15		15
	Not habitat	Dispersal	Foraging	Breeding			
Approximate density (per ha)	Score	0	10	20	30		0
	0%						
Role/importance of species population on site*	Score	0	5	10		15	
	0	5 - 15	20 - 35		40 - 45		
Total SSR score - (converted to)							15
							0.86

*SSR Supplementary Table	Scoring table			Score assigned
*Key source population for breeding	Score	0	10	
	No	Yes/ Possibly		
*Key source population for dispersal	Score	0	5	
	No	Yes/ Possibly		
*Necessary for maintaining genetic diversity	Score	0	15	
	No	Yes/ Possibly		
*Near the limit of the species range	Score	0	15	
	No	Yes		
Total for SSR Supplementary Table				

48.81			
Final habitat quality score (weighted)	AU1	AU2	AU3
Site Condition score (out of 3)	2.85	3.00	3.00
Site Context Score (out of 3)	2.46	2.52	2.52
Species Stocking Rate Score (out of 4)	0.86	0.86	0.86
Habitat Quality score - out of 10	6.17	6.38	6.38
Offset Site Average			6.31
Assessment Unit Area	28.27	16.26	4.28
Total Offset Area (ha) for MNES	48.81	48.81	48.81
Size weighting	0.58	0.33	0.09
AU Weighted Habitat Quality	3.57	2.12	0.56
Site Weighted Habitat Quality			6.26

Scoring Table						Score assigned
Score	0	5		10		0
No	Yes -			Yes - on-site		
Score	0	5	10	15		15
Not habitat	Dispersal	Foraging	Breeding			
Score	0	10	20	30		0
0%						
Score	0	5	10		15	
0	5 - 15	20 - 35		40 - 45		
Total SSR score - (converted to)						15
						0.86

Scoring table			Score assigned
Score	0	10	
No	Yes/ Possibly		
Score	0	5	
No	Yes/ Possibly		
Score	0	15	
No	Yes/ Possibly		
Score	0	15	
No	Yes		
Total for SSR Supplementary Table			

Scoring Table						Score assigned
Score	0	5		10		0
No	Yes -			Yes - on-		
Score	0	5	10	15		15
Not habitat	Dispersal	Foraging	Breeding			
Score	0	10	20	30		0
0%						
Score	0	5	10		15	0
0	5 - 15	20 - 35		40 - 45		
Total SSR score - (converted to)						15
						0.86

Scoring table			Score assigned
Score	0	10	
No	Yes/ Possibly		
Score	0	5	
No	Yes/ Possibly		
Score	0	15	
No	Yes/ Possibly		
Score	0	15	
No	Yes		
Total for SSR Supplementary Table			

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Grey headed flying fox
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	0.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator							
Impact calculator	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
	Ecological communities						
	Area of community	No		Area			
				Quality			
				Total quantum of impact	0.00		
	Threatened species habitat						
	Area of habitat	Yes		Area	48.3	Hectares	
				Quality	8	Scale 0-10	
				Total quantum of impact	38.64	Adjusted hectares	
	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
	Number of features e.g. Nest hollows, habitat trees	No					
	Condition of habitat Change in habitat condition, but no change in extent	No					
	Threatened species						
	Birth rate e.g. Change in nest success	No					
	Mortality rate e.g Change in number of road kills per year	No					
	Number of individuals e.g. Individual plants/animals	No					

Offset calculator																						
Offset calculator	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
	Ecological Communities																					
	Area of community	No				Risk-related time horizon (max. 20 years)		Start area (hectares)		Risk of loss (%) without offset		Risk of loss (%) with offset										
										Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0									
						Time until ecological benefit		Start quality (scale of 0-10)		Future quality without offset (scale of 0-10)		Future quality with offset (scale of 0-10)										
	Threatened species habitat																					
	Area of habitat	Yes	38.64	Adjusted hectares	Pineapple Farm	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	48.81	Risk of loss (%) without offset	3%	Risk of loss (%) with offset	0%	1.37	95%	1.30	1.25	10.70	27.68%	No		
							Future area without offset (adjusted hectares)		47.4	Future area with offset (adjusted hectares)	48.8											
						Time until ecological benefit	20	Start quality (scale of 0-10)	6	Future quality without offset (scale of 0-10)	6	Future quality with offset (scale of 0-10)	9	3.00	70%	2.10	2.02					
	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start value		Future value without offset		Future value with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
Number of features e.g. Nest hollows, habitat trees	No																					
Condition of habitat Change in habitat condition, but no change in extent	No																					
Threatened species																						
Birth rate e.g. Change in nest success	No																					
Mortality rate e.g Change in number of road kills per year	No																					
Number of individuals e.g. Individual plants/animals	No																					

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Greater Gldier
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	0.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator							
Impact calculator	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
	Ecological communities						
	Area of community	No		Area			
				Quality			
				Total quantum of impact	0.00		
	Threatened species habitat						
	Area of habitat	Yes		Area	48.3	Hectares	
				Quality	5	Scale 0-10	
				Total quantum of impact	24.15	Adjusted hectares	
	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
	Number of features e.g. Nest hollows, habitat trees	No					
	Condition of habitat Change in habitat condition, but no change in extent	No					
	Threatened species						
	Birth rate e.g. Change in nest success	No					
	Mortality rate e.g Change in number of road kills per year	No					
	Number of individuals e.g. Individual plants/animals	No					

Offset calculator																						
Offset calculator	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
	Ecological Communities																					
	Area of community	No				Risk-related time horizon (max. 20 years)		Start area (hectares)		Risk of loss (%) without offset		Risk of loss (%) with offset										
										Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0									
						Time until ecological benefit		Start quality (scale of 0-10)		Future quality without offset (scale of 0-10)		Future quality with offset (scale of 0-10)										
	Threatened species habitat																					
	Area of habitat	Yes	24.15	Adjusted hectares	Pineapple Farm	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	48.81	Risk of loss (%) without offset	3%	Risk of loss (%) with offset	0%	1.37	95%	1.30	1.25	4.85	20.09%	No		
										Future area without offset (adjusted hectares)	47.4	Future area with offset (adjusted hectares)	48.8									
						Time until ecological benefit	20	Start quality (scale of 0-10)	5	Future quality without offset (scale of 0-10)	5	Future quality with offset (scale of 0-10)	6	1.00	90%	0.90	0.86					
	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start value		Future value without offset		Future value with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
Number of features e.g. Nest hollows, habitat trees	No																					
Condition of habitat Change in habitat condition, but no change in extent	No																					
Threatened species																						
Birth rate e.g. Change in nest success	No																					
Mortality rate e.g Change in number of road kills per year	No																					
Number of individuals e.g. Individual plants/animals	No																					

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	0.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator							
Impact calculator	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
	Ecological communities						
	Area of community	No		Area			
				Quality			
				Total quantum of impact	0.00		
	Threatened species habitat						
	Area of habitat	Yes		Area	51.5	Hectares	
				Quality	7	Scale 0-10	
				Total quantum of impact	36.05	Adjusted hectares	
	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
	Number of features e.g. Nest hollows, habitat trees	No					
	Condition of habitat Change in habitat condition, but no change in extent	No					
	Threatened species						
	Birth rate e.g. Change in nest success	No					
	Mortality rate e.g Change in number of road kills per year	No					
	Number of individuals e.g. Individual plants/animals	No					

Offset calculator																						
Offset calculator	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
	Ecological Communities																					
	Area of community	No				Risk-related time horizon (max. 20 years)		Start area (hectares)		Risk of loss (%) without offset		Risk of loss (%) with offset										
										Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0									
										Time until ecological benefit		Start quality (scale of 0-10)										Future quality without offset (scale of 0-10)
	Threatened species habitat																					
	Area of habitat	Yes	36.05	Adjusted hectares	Pineapple Farm	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	48.81	Risk of loss (%) without offset	3%	Risk of loss (%) with offset	0%	1.37	95%	1.30	1.25	8.75	24.26%	No		
										Future area without offset (adjusted hectares)	47.4	Future area with offset (adjusted hectares)	48.8									
										Time until ecological benefit	20	Start quality (scale of 0-10)	6									
	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start value		Future value without offset		Future value with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
Number of features e.g. Nest hollows, habitat trees	No																					
Condition of habitat Change in habitat condition, but no change in extent	No																					
Threatened species																						
Birth rate e.g. Change in nest success	No																					
Mortality rate e.g Change in number of road kills per year	No																					
Number of individuals e.g. Individual plants/animals	No																					

9.0 Management measures

This section outlines the management actions that will be undertaken throughout the course of the offset on the offset site to achieve the offset site outcomes for each MNES (**Section 5.2**). Monitoring of the management actions will be ongoing to assess their efficacy and the results documented in progress reporting (**Section 11.0**). Based on the results of monitoring, management actions will be reassessed, as required, to specifically target offset values and help drive achievement of the offset outcomes within the target timeframes. The management actions and monitoring will be implemented until all completion criteria are achieved.

9.1 Adaptive management approach

The management actions identified in this OMP are based on relevant recommended guidelines, MNES conservation advice and offset site conditions. Monitoring of the management actions will be implemented to assess the overall success of the actions. Corrective actions will be applied if results from monitoring prove the management actions ineffective, and further monitoring will be conducted to assess if the change in actions results in progress towards achieving the offset outcomes and performance criteria.

To maintain relevance and effectiveness, this OMP will require review and amendment throughout the management period to ensure that management actions and monitoring activities within this document remain effective. This document will be reviewed and updated as required, for example:

- When there is a modification of the management and monitoring methods;
- When trigger criteria are exceeded and additional measures are required to minimise risks and threats to MNES; or
- When a legislative change or modification of best practice methods affects the currency of this document.

A compliance register will be developed to track how commitments are being achieved and will be provided in the annual report. This compliance register will include document tracking for all reporting required, along with a description of how data and reporting is stored and disseminated.

9.2 General restrictions

Table 9.1 outlines general restrictions within the offset site.

Table 9.1 Offset site restrictions

Restriction	Description
Unauthorised access	Unauthorised personnel will not be allowed to access the offset site. Only the landholder, landholder guests, Karreman Quarries personnel and contractors engaged by Karreman Quarries directly involved in the implementation and/or monitoring of approved management actions will be allowed to access the site. Karreman Quarries and engaged contractor personnel will advise the landholder upon entry and exit of the offset site and gates and locks left as found. Gates to the offset site will be locked, with the keys managed by the landholder and Karreman Quarries. Existing fencing and locks will be maintained, and new fencing and locks established where required for access restriction. Signage will be established at access points of the offset site that recognise the area is protected for conservation purposes and will advise the area is restricted to authorised personnel only. The offset site will be demarcated on site plans.
Access restrictions	The landholder and landholder guests will be allowed to access the site. Karreman Quarries personnel and contractors engaged by Karreman Quarries will be allowed to access the site for the purposes of implementing and/or monitoring approved management actions. Karreman Quarries and engaged contractor personnel will advise the landholder upon entry and exit of the offset site

Restriction	Description
	and gates and locks left as found. The landholder will be able to utilise and invite groups of up to 10 guests to utilise the offset site for nature based recreation activities such as bushwalking, birdwatching and camping provided there is no damage (or risk of damage) to the conservation values of the offset site or the achievement of the offset outcomes.
Access tracks	Vehicle movement will be restricted to designated access tracks, firebreaks and fence lines. Existing and new access tracks (if required) are illustrated in Figure 9.1. Access tracks, fence lines and firebreaks will be maintained as required. Existing and new access tracks will be maintained no wider than 5 m and vegetation disturbance minimised. Usage of access tracks will only occur when the weather permits. Gully crossings will be repaired following rainfall events as required to maintain access.
Unauthorised vehicles and equipment	No unauthorised vehicles or equipment will be allowed to enter the offset site. Authorised personnel entering the offset site will be required to hold a valid weed hygiene declaration for vehicles (and, where appropriate, relevant equipment). Evidence is to be provided on request to the landholder that any vehicles (or relevant equipment) used for management actions and monitoring audits are clean prior to entry to minimise the risk of introduction and spread of weeds. Authorised vehicle movement will be limited to existing and designated access tracks, fence lines and firebreaks in the offset site and will only be permitted during suitable weather conditions.
Vegetation clearing	Clearing of native vegetation will not be permitted within the offset site unless the clearing is required for: • Installation and/or maintenance of access tracks and/or firebreaks identified in this OMP; • Fence establishment and maintenance for fences identified in this OMP; • Weed management; • Thinning to encourage growth of large trees and/or increase species diversity; • Ensuring public safety or as directed by emergency management response personnel in the event of uncontrolled fire or another emergency procedure In all these circumstances, disturbance of native vegetation to be minimised.
Livestock grazing	Livestock grazing will not be allowed in the offset site.
Timber harvesting and firewood collection	Timber harvesting and firewood collection will not be allowed in the offset site.
Fodder harvesting	Harvesting vegetation for fodder will not be allowed in the offset site.
Activities detrimental to the conservation purposes of the offset	With the exception of the management activities identified within this OMP, no activities that are likely to, or pose a risk of, damage to wildlife or native vegetation will be permitted within the offset site. Low impact activities (such as bushwalking and birdwatching) will be permitted at the landholders discretion provided they do not damage (or cause a risk of damage to) the conservation value of the offset site or the achievement of the offset outcomes.

9.3 Fencing

Existing domestic stock fencing will be maintained to prevent access by livestock, unauthorised personnel and vehicles. **Figure 9.1** illustrates the location of new and relevant existing fencing to protect the offset site. Barbed wire where it is present will be removed and replaced with plain wire.

The identified fence lines (**Figure 9.1**) will be maintained by Karreman Quarries until all completion criteria are achieved, see **Table 9.2**.

9.3.1 Milestones and outcomes

The milestones and outcomes for this management action are provided below in **Table 9.2**.

Table 9.2 Milestones and completion criteria for fencing in the offset site

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Remove barbed wire fencing	Reduce entanglement threat to GHFF	Remove all barbed wire fencing or barbed wire over cyclone mesh fencing where it occurs and replace with either fauna friendly fencing or plain wire within 6 months of securing offset.	Works completed within 6 months of OMP implementation.	Works completed and evidence of completion provided in monitoring report.
Install fauna friendly fencing	General offset site protection and prevention of anthropogenic disturbance	Restrict vehicle and domestic livestock access within offset area within 1 year of OMP implementation.	Works completed within 1 year of OMP implementation.	Works completed and evidence of completion provided in monitoring report.
Temporary electric fencing to planting areas	Protection of habitat trees through reducing grazing by herbivores.	Multi-strand temporary electric fencing to boundary of newly planted areas in March prior to first planting.	1: Installation completed and fences tested. 2: Monthly inspection whilst in place and photographic evidence of inspection collected.	Planted trees exceed 1 m in average height.
Maintain fences	Protection of establishing habitat trees, all values.	Visual inspection of all permanent fences annually with repairs conducted as required.	1: Annual inspection completed and evidence of inspection collected and provided in monitoring report	Offset completion, when all other completion criteria have been met.
Signage	All values	Installation of advisory signage on any access tracks open interfaces (where fauna friendly fencing with urban land use) within 1 year of securing offset. With annual inspection to ensure signage remains in place.	1: Signage design completed within 6 months of securing offsets. 2: Signage installed within 12 months of securing offsets 3: Annual inspection and evidence collected for monitoring report.	Offset completion, when all other completion criteria have been met.



Source: Attexo (2021), DNRME (2021),

Legend

Desc_	
— Cattle Fence New	— Track
— Cattle Fence Remove	Protected areas
— Koala Fencing - Existing	
— Koala Fencing - To be Installed	
— Fence retained (top barb removed)	



Offset Site 1 - Pineapple Farm

Karreman Quarries Pty Ltd
Mount Cotton Quarry
Figure 9.1 Fences & Tracks

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Attexo

9.4 Weed control

Table 9.3 provides the general weed control program proposed for the offset site where significant revegetation is required either because no trees are present, or stem densities are very low.

Table 9.3 Proposed weed control program planted areas

Timing	Description
February 2 years prior to planting, in the first summer after the OMP is implemented.	Primary weed control, broad selective spray with graminoid specific.
April 2 years prior to planting	Follow up weed control, broad selective spray with graminoid specific herbicide and broad spectrum systemic as required.
December 1 year prior to planting	Follow up weed control, broad selective spray with graminoid specific herbicide and broad spectrum systemic as required.
January 1 year prior to planting	Follow up weed control, broad selective spray with graminoid specific herbicide and broad spectrum systemic as required. Application of pre-emergent herbicide applied based on predicted rainfall events.
December prior to planting	Follow up weed control, selective spray with graminoid specific herbicide and broad spectrum systemic as required.
March Prior to planting	Follow up weed control, broad selective spray with graminoid specific herbicide and broad spectrum systemic as required. Application of pre-emergent herbicide applied based on predicted rainfall events.
Post planting year 1	Bi-monthly application, spot spray as required.
Post planting year 2-5	Quarterly application, spot spray as required.
Post planting year 5 - 20	Nominally twice annually during the wet season

Methods of weed control in areas of existing native and regrowth vegetation necessarily differ from areas that have no existing tree cover. The intent is to provide weed control to support native plant establishment following Churchill (2004) and using a modified Bradley method. With canopy and sub-canopy tree densities established early, followed by enrichment work commencing in areas with lower levels of weed encroachment.

The proposed weed control program for areas of existing remnant or advanced regrowth is provided in **Table 9.4**.

Table 9.4 General weed control program vegetated areas

Timing / Milestones	Description
November prior to planting in the first year of the implementation of the OMP.	Primary weed control, selective weed control with broad spectrum systemic herbicide.
January prior to planting	Follow up weed control, selective broad spectrum systemic as required accompanied with marking out for tree planting, the application of a pre-emergent herbicide manually cultivated into soil surface.
March/April during planting	Spot spray as required.
Post planting year 1	Monthly application, spot spray as required.
Post planting year 2-5	Bi-monthly application, spot spray as required.

Timing / Milestones	Description
Post planting year 5 - 20	Nominally twice annually during the wet season

9.4.1 Milestones and outcomes

Milestones and outcomes for weed control within the offset site are provided below in Table 9.3 **Table 9.5**.

Table 9.5 Milestones and completion criteria for weed control in the offset site

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Primary pre-planting weed control	Habitat tree stem density and richness for Koala, GHFF and Greater Glider improved mobility for Koala and reduction in predation and habitat degradation threat for both species.	6 step weed control program for preparing offset site for tree planting; commence within 6 months of securing offset and two years prior to planting.	Refer to Table 9.3	No weed competition within 2 m of any proposed tree planting location evidence collected for monitoring report
Post planting weed control	Habitat tree stem density and richness for Koala, GHFF and Greater Glider.	3 step weed control program for maintaining planted tree stock, preparing for enrichment planting and direct seeding; commence immediately as trees are planted.	Refer to Table 9.3	No weed competition within 2 m of any planted tree evidence collected for monitoring report
General weed control program	Habitat tree stem density and richness for Koala, GHFF and Greater Glider.	6 step weed control program for reducing weed cover in vegetated areas and preparing for supplementary planting and seeding; commence within 6 months of securing offset.	Refer to Table 9.4	Weed cover in offset is less than <4% for two consecutive years and habitat attribute score 5

9.4.2 Vegetation species richness

Active development of species richness will commence from year 5 once site capture and suitable weed suppression is in place, with nominally 2 significant planting and seeding events. Plant establishment will be through either cellular trays or Hiko tubes with plants established from provenance collected seed and planted at densities reflecting the technical descriptions for the relevant regional ecosystem.

9.4.2.1 Milestones and outcomes

Table 9.6 provides the milestones and outcomes for the management of vegetation species richness within the offset site.

Table 9.6 Vegetation species richness management actions, milestones and completion criteria

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Monitoring	Species richness, canopy tree recruitment, native perennial grass and shrub cover. These values contribute to MNES Koala, GHFF and Greater Glider in their contribution to general habitat condition, ongoing weed suppression and habitat resilience post management.	Annual monitoring of forest condition to determine additional management actions that may be required.	1: Monitoring completed 2: Monitoring report prepared	Monitoring report completed
Adaptive management	All values	New management actions relating to species richness and ground cover not yet identified. Where identified in annual monitoring results, the new management action in addition to this OMP will be updated accordingly.	1: Management actions identified during monitoring completed	Management actions completed Recruitment of canopy tree species exceeds 70% and BioCondition score 5 Native plant species richness exceeds 90% and BioCondition score 5 for all lifeforms for two consecutive monitoring periods and at final monitoring.

9.4.3 Restricted invasive weeds

Lantana camara is listed as a Category 3 restricted matter under the *Biosecurity Act 2014* and is a Weed of National Significance (WoNS) and was found to occur within the offset site. High biomass grasses including *Melinis repens* and *Megathyrsus maximus* are also present within the offset site.

Herbicides that effectively control *Lantana* are provided in **Table 9.7**. All weed control actions implemented will be documented in progress reports (**Section 11.0**).

Table 9.7 Herbicides for the control of *Lantana camara* (DAF 2020a)

Situation	Herbicide	Rate	Optimum Time	Method
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Fluroxypyr 200 g/L (e.g. Flagship 200)	500 mL to 1 L/100 L water	October-April (only a guide – <i>Lantana camara</i> must be actively growing for the herbicide to work)	Thorough wetting of plants is required, higher rate should be used for larger plants.
	Fluroxypyr 333 g/L (e.g. Starane Advanced)	300–600 mL/100 L water		
	Fluroxypyr 400 g/L (e.g. Comet 400)	250–500 mL/100 L water		

9.4.4 Hygiene protocols

It is critical that new declared, high threat or WoNS weeds are not introduced into the offset site. Invasive weeds are the primary focus for control measures, however, other pests and diseases may indirectly be introduced and spread therefore require hygiene procedures, as necessary.

To reduce the transfer of weed vegetation, seed, mud or soil material, the following washdown procedures outlined in **Table 9.8** will be implemented where personnel, vehicles or equipment have been in an invested area prior to entering the offset site.

Table 9.8 Weed hygiene control procedures

Procedure	Description
Pre-washdown	1. Position vehicle/equipment safely and ensure stability (i.e. brakes applied); 2. Remove excessive debris (i.e. mud, branches) for appropriate disposal using a dry cleaning method before wet where possible (e.g. scrape off mud before pressure hose applied); 3. Detach removable items or parts and decontaminate individually.
Decontamination of external surfaces	1. Start top-down of vehicle or equipment; 2. Vehicles and equipment with moving parts (i.e. wheels, trays, buckets) will need to be removed to access all areas; 3. Wet decontamination procedure: apply disinfectant/detergent and leave for appropriate contact time (usually 10 minutes) then rinse with clean water; 4. If other techniques e.g. heat, fumigation for tools, equipment and other things are required, ensure exposure requirements are met as required by disease/pest guidelines.
Decontamination of internal surfaces	1. Only necessary if internal surfaces are exposed to potential contamination; 2. Protective covers (i.e. seat covers, dash covers) will be removed and cleaned or appropriately disposed of; 3. Remove solid materials with a vacuum, cloth or brush; 4. Air filters will be removed, replaced and cleaned (technician may be required). 5. Surfaces can be wiped or sprayed with 70% alcohol or another appropriate disinfectant.

9.5 Stem density

Table 9.9 provides the planting and vegetation thinning actions required to manage stem density and improve vegetation structure in the offset site.

Table 9.9 Actions to manage stem density in the offset site

Year	Action
3	Initial tree planting to bring stem density to 1500 stems/ha following the 1:1 Eucalypt to Acacia method, using provenance seed collected under contract and grown under contract using the Hiko system (Hiko planting system is a cell based planting system used extensively in the establishment of commercial hardwood plantations and is relatively cost and time effective for commercial scale forestry planting that can be leveraged for the relatively small scale plantings proposed for the offset. The approximate total number of trees to be established is 60,000, however this includes existing mature and semi mature trees and young regrowth that is present in large areas of the site, the total number of trees to be planted is estimated to be 22,000. Koala, GHFF and Greater Glider habitat trees will be planted in relative densities following the relevant RE technical descriptions. Planting will occur when a suitable moisture profile is developed in planting beds with follow up watering conducted as required. Plantings will be monitored every two days for the first 6 weeks, weekly from week 7 through week 12 and fortnightly week 12 through the end of the first year post planting.
7	Initial planting will be thinned to 400 stems/hectare. Second supplementary planting will be undertaken to develop vertical forest structure, maintain tree density and that relative abundance reflects the relevant RE technical descriptions.
12	A third supplementary enrichment planting will be conducted nominally to support the continued development of vertical structure and establishing any missing structural elements based on the regional ecosystem technical description.

9.5.1.1 Milestones and outcomes

Milestones and completion criteria for stem density are provided below in **Table 9.10**.

Table 9.10 Milestones and completion criteria for the management of stem density in the offset site

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Seed collection	Habitat tree stem density for Koala, GHFF and Greater Glider improved forage resources, reduction in predation and habitat degradation threat. Improved species stocking rate.	Contract provenance seed collection with collection records and spatial data of collection sites, number of trees for each species recorded; immediately after offset site is secured.	1: Sufficient certified seed collected, and certification received. 2: Spatial data of collection sites provided.	Sufficient quantity of certified seed is collected and delivered and evidence collected for monitoring report.
Seedling production	Habitat tree stem density for Koala, GHFF and Greater Glider, improved forage resources, reduction in predation and habitat degradation threat. Improved species stocking rate.	Establishment of seedlings in Hiko trays composition reflecting relevant RE technical description; nominally 6 months prior to planting and based on the advice of the contracted nursery.	1: Cells seeded, evidence collected 2: Cells ready for planting 3: Cells reflect correct composition for regional ecosystem 4: Provision of certification statement form contracted nursery on tray composition	Trees delivered to site and evidence collected for monitoring report.

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
			and provenance of seedling stock.	
Soil testing, soil amelioration and fertiliser program	Weed suppression, refuge tree development for Koala, Greater Glider and early flowering of eucalypts for GHFF and Greater Glider forage resources.	Immediately after offset site is secured, soil sampling program for offset site and reference sites (undisturbed forest) of the relative RE. Subsequently an agronomic report is developed to (a) identify any soils issues relating to past land use; and (b) develop a fertiliser program to drive early tree growth tapering to natural nutrient conditions after 20 years.	1: Agronomist commissioned 2: Soil survey program prepared 3: Soil survey program completed 4: Agronomists report completed 5: Completion of field program	All recommendations of Agronomy report implemented and evidence provided to monitoring report.
Primary planting	Habitat tree stem density for Koala, GHFF and Greater Glider, improved forage resources, reduction in predation and habitat degradation threat. Improved species stocking rate.	Field seedling establishment to 1600 stems/ha composition reflecting technical descriptions for relevant RE; Autumn nominally 2 years post site preparation commencement.	Trees planted to 1600 stems per ha Koala and GHFF habitat tree composition reflects technical description for regional ecosystem.	Native tree species richness > 90% of benchmark and BioCondition score for attribute 5 in two consecutive monitoring periods.
Thinning and secondary planting and seeding	Habitat tree stem density, structure and richness for Koala, GHFF and Greater Glider, improved forage resources, reduction in predation and habitat degradation threat. Improved species stocking rate.	Selective thinning of established trees to release most dominant specimens. With planting to balance stand composition to match relevant RE technical description. Direct seeding of native understorey species at 0.4 gm per square metre. Thinning to occur nominally 5 years after primary tree planting. With seed collection commencing immediately post primary tree planting.	1: Thinning complete 2: Planting plan developed 3: Direct seeding plan developed (palletisation, insecticide treatments, pre-sowing requirements etc.) 4: Provenance seed collected, cleaned certified. 5: Planting completed. 6: Planting and seeding completed	All milestones completed and evidence collected for monitoring report. Tree canopy height exceeds 70% of benchmark and BioCondition score 5. Tree canopy cover lies between 50% and 200% of BioCondition benchmark and BioCondition score 5. Coarse woody debris lies between 50% and 200% of BioCondition benchmark and BioCondition score 5. GHFF High yield food tree cover >80% of benchmark and habitat score 10. GHFF forage tree cover exceeds 80% of benchmark and habitat score 10. GHFF forage tree richness exceeds 80% of benchmark and habitat score 10.

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
				Non-juvenile Koala habitat trees exceed 90% of benchmark Koala habitat tree richness exceeds 80% of benchmark. Non-juvenile tree species with dense crowns exceeds 80% of benchmark. All above completion criteria exceed benchmark criteria in two consecutive monitoring periods And at final monitoring. Koala refuge trees exceeds 50% of benchmark at final monitoring.
Tertiary planting and seeding	Habitat tree stem density, structure and richness for Koala, GHFF and Greater Glider. Improved general habitat condition against BioCondition benchmarks and establish a third crop of habitat trees and provide a resource for Juvenile Koala tree development over time.	Additional interplanting nominally after 10 years (5 years post secondary planting) to balance stand composition, provide additional vertical forest structure and further develop richness in lower forest stratum and to provide additional seed bank for the development of juvenile Koala tree density.	1: Planting plan developed 2: Direct seeding plan developed (palletisation, insecticide treatments, pre-sowing requirements etc.) 3: Provenance seed collected, cleaned certified. 4: Planting completed. 5: Planting and seeding completed	All milestones complete and evidence collected for monitoring report Juvenile Koala habitat tree density exceeds 80% of benchmark habitat score 10 at final monitoring.

9.5.2 Coarse woody debris and organic litter

Thinning to promote the development of coarse woody debris will include natural senesce associated with shorter lived Acacia species (see **Table 9.9**) and mechanical thinning to reduce canopy tree densities to reflect regional ecosystem technical description average stem densities and to promote flowering.

9.5.2.1 Milestones and outcomes

Table 9.11 provides the milestones and completion criteria for the management of coarse woody debris within the offset site.

Table 9.11 Milestones and completion criteria for the management of coarse woody debris in the offset site

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Monitoring	Coarse woody debris and Organic Litter ground cover These values contribute to MNES Koala, GHFF and Greater Glider in their contribution to general habitat condition, ongoing weed suppression and habitat resilience post management.	Annual monitoring of forest condition to determine additional management actions that may be required.	1: Monitoring completed 2: Monitoring report prepared	Monitoring report completed
Adaptive management	All values	New management actions relating to species richness and ground cover not yet identified. Where identified in annual monitoring results, the new management action in addition to this OMP will be updated accordingly.	1: Management actions identified during monitoring completed	Management actions completed Coarse woody debris lies between 50% and 200% and BioCondition score 5 in two consecutive monitoring periods and at final monitoring. Organic litter lies between 50% and 200% of benchmark and BioCondition score 5 two consecutive monitoring periods and at final monitoring.

9.5.3 Promotion of early flowering in GHFF and Greater Glider habitat trees

In addition to thinning, a fertiliser program based on soil test results and pre and during wet season applications of fertiliser aimed at maximising Eucalypt growth will be implemented in the first 5 years, to support early site capture and to promote early flowering of trees. This will maximise weed suppression and aid natural recruitment of canopy species through seed drop as well as providing improved foraging resources for both Koala and GHFF.

9.5.3.1 Milestones and outcomes

Table 9.12 provides the milestones and outcomes for the offset for this management action.

Table 9.12 Milestones and completion criteria for the management of promotion of early flowering trees

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Soil testing, soil amelioration and fertiliser program	Early flowering of eucalypts for GHFF and Greater Glider forage resources.	Immediately after offset site is secured, soil sampling program for offset site and reference sites (undisturbed forest) of the relative RE will commence. Subsequently an agronomic report is developed to (a) identify soils issues relating to past land	1: Agronomist commissioned 2: Soil survey program prepared	All recommendations of Agronomy report implemented and evidence provided to monitoring report.

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
		use; and (b) develop a fertiliser program to drive early flowering of GHF habitat trees (tapering to natural nutrient conditions after 20 years).	3: Soil survey program completed 4: Agronomists report completed 5: Completion of field program	Primary and secondary planting GHFF habitat tree specimens have flowered twice, evidence gathered and supplied in monitoring report.
Monitoring	Monitor flower response in T1 and T2 GHFF and Greater Glider habitat trees	Annually from year 10, monitoring of flower response and nutritional state of soils will commence to determine additional management actions that may be required.	1: Monitoring completed 2: Monitoring report prepared	Monitoring report completed
Adaptive management	All values	New management actions relating to species richness and ground cover not yet identified. Where identified in annual monitoring results, the new management action in addition to this OMP will be updated accordingly.	1: Management actions identified during monitoring completed	Management actions completed

9.5.4 Refuge trees, trees with dense crowns and large trees

Redland Bay has an average annual rainfall of approximately 1250 mm (BOM 2021). Ngugi et al. (2015) reported on a long-term study (1936 – 2011) of over 86,400 trees in Eucalypt dominated native forests. They found a direct relationship between rainfall and increases in tree diameter with the greatest increases occurring in the rainfall range 1200 – 1600 mm. The study found that the mean DBH increase across all species and forest types in areas with rainfall of 1200 mm was 0.24 cm per annum. Species relevant to the offset sites located in 1200 mm rainfall sites had average DBH ranging from a low of 0.18 cm per year (*Corymbia intermedia*) to a maximum of 0.36 cm per year (*Eucalyptus fibrosa*). However, in planted situations native trees have been shown to perform much better. Maraseni et al. conducted replicated growth trials on *Corymbia citriodora* subsp. *citriodora* planted at a range of stem densities in moderately fertile sites at Warril View in SEQ (Average rainfall at nearest weather station 907 mm). Planting of 343 stems per ha achieved an average DBH of 34.62 cm after 15.16 years (without post planting fertilisation) and that even at stem densities of up to 1189 stems per hectare the trees easily exceeded the growth rates measured by Ngugi et al. (2015) achieving average DBH after 15.16 years of 20 cm.

Given the known growth rates of relevant tree species in SEQ trails with similar rainfall there is a high degree of certainty that benchmark fodder and refuge tree numbers for Koala and flowering / forage trees for GHFF and Greater Glider can be achieved in the timeframe. With respect to proposed increases to large trees these are anticipated to be primarily from trees that are already present within the offset areas, either as mature specimens or semimature regrowth specimens. Existing trees will benefit from interplanting with nitrogen fixing species and reduced competition from native and exotic pasture species. In addition, management actions are proposed to include soil amelioration and fertilisation of soils and if needed corrective actions could include specific fertilisation or hormone treatments to promote increased growth of dominant specimens within the offsets.

Further management actions may be required based on the results of annual monitoring. Milestones and outcomes

Table 9.13 provides the milestones and outcomes for the offset for this management action.

Table 9.13 Milestones and completion criteria for the management of refuge trees, trees with dense crowns and large trees

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Monitoring	N/A	Monitoring of forest condition annually to determine additional management actions that may be required.	1: Monitoring completed 2: Monitoring report prepared	Monitoring report completed
Adaptive management	Large trees, Koala refuge trees and non-juvenile trees with dense crowns	New management actions relating to species richness and ground cover not yet identified. Where identified in annual monitoring results, the new management action in addition to this OMP will be updated accordingly.	1: Management actions identified during monitoring completed	Management actions completed

9.5.5 Large tree retention and hollow development

Management actions for this attribute include thinning and tree planting to promote DBH growth and hollow development. Further management actions may be required based on the results of annual monitoring.

9.5.5.1 Milestones and outcomes

Table 9.14 provides the milestones and outcomes for the offset for this management action.

Table 9.14 Milestones and completion criteria for the management of hollow development

Management Action	Targeted Habitat Value	Description	Timing	Milestones	Completion Criteria
Record number of hollows present	Density of suitable hollows /ha for Greater Glider denning habitat	High quality Greater Glider habitat will have a minimum of 6 hollows >5cm in diameter and higher than 4 m per ha).	Record / map all hollows present within offset sites in the fifth year.	1: Hollow density within site identified 3 years post the implementation of the OMP. 2: If minimum hollow density not met, employ Glider Chainsaw Hollow methods (Griffiths et al. 2018) and monitor 3: Monitoring of natural and artificial hollows completed 4: Monitoring report prepared	Monitoring report completed
Increase the number of hollows	Denning habitat for Greater Glider	Using the method described by Griffiths et al. 2018	From the fifth year of management	1: Suitable Greater Glider Hollow density meets or exceeds 6 per ha.	Hollow density achieved and maintained throughout offset

Management Action	Targeted Habitat Value	Description	Timing	Milestones	Completion Criteria
		install hollows into suitably sized trees			sites for two consecutive reporting periods.
Adaptive management	Density of hollows/ha	New management actions relating to hollow development not yet identified.	Annually after the fifth year	1: Management actions identified during monitoring completed	Management actions completed

9.6 Fire and fuel load management

The following measures will be implemented to reduce the fire hazard within the offset site:

- Establish and maintain existing and new fire breaks (maintenance at least annually at beginning of dry season). Proposed and existing fire break locations are illustrated in **Figure 9.1**;
- Reduce standing and accumulated fuel load through low-intensity controlled burns;
- Controlled burns based on present fuel load and REs in the offset site, as outlined in the Regional Ecosystem Description Database (REDD) (Peeters and Butler 2014), see **Table 9.15**.

Table 9.15 REDD fire management guidelines for regional ecosystems present in offset site

Regional Ecosystem	Fire management guidelines
12.3.11a	• Season – Summer to late autumn (December to May). • Intensity – Low • Interval – 3-6 years • Strategy – Burn 40-60% of any given area. Spot ignition in cooler or moister periods encourages mosaics. Note: Control of weeds is a major focus of planned burning in most areas. Maintain ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas.
12.11.24	• Season – Summer to Winter (December to August). • Intensity – Low to moderate • Interval – 4-25 years. • Strategy – Burn 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. Note: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds is a major focus of planned burning in most areas. Careful thought should be given to maintaining ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics.

The controlled burns will be agreed by Karreman Quarries and the landholder and conducted by the landholder or by specialist controlled burn subcontractors as agreed by the parties. No more than 20% of the offset site shall be planned to be burnt in controlled burns in any calendar year.

9.6.1 Milestones and outcomes

Milestones and completion criteria for fire management in the offset site are provided below in **Table 9.16**.

Table 9.16 Milestones and completion criteria for fire management in the offset site

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Fire Management Plan	All values notably CWD, species richness, shrub cover and non-juvenile Koala habitat tree density	Develop a fire management plan for the offset site within 1 year of securing offset.	1: Fire management plan completed	Fire management plan approved
Fire field works	All values	Undertake works recommended by fire management plan.	1: Completion of actions described in fire management plan	Completion of actions in fire management plan
Monitoring	All values	Undertake annual monitoring actions described in fire management plan	1: Monitoring completed 2: Monitoring report prepared	Monitoring report completed
Adaptive management	All values	New management actions relating to fire management. Where identified in annual monitoring results, the new management action in addition to this OMP will be updated accordingly.	1: Management actions identified during monitoring completed	Management actions completed

9.7 Pest animal control

Pest animals that have been identified as likely to occur within or in the vicinity of the offset site include:

- Wild dogs (*Canis lupis familiaris*);
- Feral cats (*Felis catus*);
- Foxes (*Vulpes vulpes*);
- Feral pigs (*Sus scrofa*);
- Rabbits (*Oryctolagus cuniculus*).

Where pest animals are recorded in the offset site during monitoring events, pest animal control will be undertaken by a suitably qualified person in accordance with the *Biosecurity Act 2014*.

Table 9.17 outlines the recommended control methods for these restricted invasive animals (should they be required) whilst **Table 9.18** provides the milestones and outcomes for pest animal control (should they be required).

Table 9.17 Control methods for pest animal species

Species	Recommended Control Method	Reference
Wild dogs	- Reduce food scraps left in the vicinity and dispose of appropriately to discourage animals - Dog exclusion mesh fencing and electric fencing - Trapping and/or baiting and/or shooting in accordance with the DAF guidelines (2020a)	- South-East Queensland Koala Conservation Strategy 2020-2025 (DES 2020a) - Wild dog <i>Canis familiaris</i> fact sheet (DAF 2020b)
Feral cats	- Reduce food scraps left in the vicinity and dispose of appropriately to discourage animals - Trapping and/or baiting and/or shooting in accordance with the DAF guidelines (2020a)	Feral cat <i>Felis catus</i> fact sheet (DAF 2020c)
Foxes	- Reduce food scraps left in the vicinity and dispose of appropriately to discourage animals - Trapping and/or baiting and/or shooting in accordance with the DAF guidelines (2020b)	European fox <i>Vulpes vulpes</i> fact sheet (DAF 2020d)
Feral pig	- Reduce food scraps left in the vicinity and dispose of appropriately to discourage animals - Trapping and/or baiting and/or shooting in accordance with the DAF guidelines (2020c)	Feral pig <i>Sus scrofa</i> fact sheet (DAF 2020e)
Rabbit	- Harbour destruction and warren ripping in accordance with the DAF guidelines (2020d) - Biological controls (e.g. myxomatosis virus), baiting and warren fumigation (DSEWPC, 2011b)	Feral European rabbit <i>Oryctolagus cuniculus</i> (DSEWPC 2011)

9.7.1 Milestones and outcomes

Milestones and completion criteria for fire management in the offset site are provided below in **Table 9.18**.

Table 9.18 Milestones and completion criteria for pest animal control in the offset site

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
Develop Monitoring and Management Plan	Threat reduction for Koala	Develop monitoring and proposed humane management measures to reduce threat to Koalas by non-native predators, nominally roaming domestic dogs within 1 year of securing offset.	1: Monitoring and Management Plan completed for all offsets	Monitoring and Management Plan completed and approved.
Monitoring	Threat reduction for Koala	Remote sensing camera monitoring stations, based on the Monitoring and Management Plan, within 2 years of offset establishment.	1: Monitoring program in place	Completed at final monitoring.
Adaptive management	Threat reduction for Koala	New management actions relating to species richness and ground cover not yet identified. Where identified in annual monitoring results,	1: Management actions identified	Management actions completed and final monitoring.

Management Action	Targeted Habitat Value	Description	Milestones	Completion Criteria
		the new management action in addition to this OMP will be updated accordingly.	during monitoring completed	

9.8 Offset scoring milestones

As outlined **Section 11.0**, offset monitoring reports will be prepared every five years. These offset monitoring reports will present progress against actions and milestones as outlined in **Section 9.0**. To assess progress of the offset sites, interim habitat quality scores for each MNES fauna species have been developed. This includes proposed scores for each separate AU and for each reporting period as shown in **Table 9.19**.

Table 9.19 Habitat quality scoring milestones for the offset site

Value	AU1	AU2	AU3	Weighted score
Koala				
Year 0	5.78	7.26	7.09	6.39
Year 5	6.31	7.43	7.30	6.77
Year 10	6.83	7.60	7.51	7.15
Year 15	7.36	7.77	7.73	7.53
Completion	7.89	7.94	7.94	7.91
Grey-headed Flying-fox				
Year 0	4.99	7.81	7.65	6.16
Year 5	6.04	8.25	8.13	6.96
Year 10	7.10	8.68	8.60	7.76
Year 15	8.15	9.12	9.08	8.55
Completion	9.20	9.56	9.56	9.35
Greater Glider				
Year 0	4.07	5.35	5.66	4.63
Year 5	4.59	5.60	5.84	5.04
Year 10	5.12	5.86	6.02	5.45
Year 15	5.65	6.12	6.20	5.85
Completion	6.17	6.38	6.38	6.26

10.0 Monitoring actions

A monitoring program will be implemented to evaluate the overall success of the offset and success of the management actions employed. The monitoring program aims to assess how successful the management actions are in improving the condition of habitat features and supporting vegetation for MNES and achieving and maintaining the offset outcomes. The results from monitoring programs will be used to document the progress of the offsets, which corrective actions should be implemented, and when all completion criteria have been achieved.

10.1 General offset area monitoring

General offset area monitoring actions will be undertaken on an annual basis until the end of the approved life of the offset (20 years) and when all completion criteria are achieved, see **Table 12.1**.

This information gathered from monitoring actions will be used to identify urgent and high priority management actions. GPS locations shall be recorded of observed issues to help direct and track the success of management actions. The results of this monitoring will be included in progress reporting for the period.

It is also noted that the landowner will also conduct general offset area monitoring on an 'as required'/ad hoc basis between the regular scheduled offset monitoring events in spring and autumn.

Table 10.1 General offset area monitoring actions

Monitoring Action	Description	Frequency
Fence and access track monitoring	- Location of all offset site access points and tracks will be driven and inspected annually, with GPS points and photographs noting any signs of damage or use (i.e. floods, runoff, livestock, unauthorised vehicles); - All offset site fencing will be driven and inspected annually for damage by floods, fire, pest animals or livestock or access by unauthorised personnel and vehicles. Repair and maintenance implemented as required; and - Results from monitoring surveys will be provided in progress reporting (Section 11.0) and assess the effectiveness of fencing and inform corrective actions to be applied.	Annually Year 1-20
Weed monitoring	- Baseline surveys will follow methodology in the <i>Field Manual for Surveying and Mapping Nationally Significant Weeds</i> (McNaught et al. 2008) and be undertaken by a suitably qualified bush regeneration contractor and/or suitably qualified ecologist. - Baseline surveys of the offset site for declared (restricted or prohibited) weeds, high threat (koala) (e.g. Lantana) and WoNS weeds will be undertaken to determine the distribution and abundance of key weed species and will inform initial weed mapping.	Year 1
	- Weed monitoring surveys will follow methodology in the <i>Field Manual for Surveying and Mapping Nationally Significant Weeds</i> (McNaught et al. 2008) and be undertaken by a suitably qualified bush regeneration contractor and/or suitably qualified ecologist. - Weed monitoring surveys will then be undertaken at any mapped infestation sites during general offset area monitoring surveys and opportunistically when checking fences, firebreaks and access tracks. Weed cover will also be measured in the permanent monitoring transects in line with the monitoring frequency outlined in Section 10.1. - Results from monitoring surveys will be provided in progress reports (Section 11.0) and will be used to update weed mapping, assess the effectiveness of current weed control actions and inform corrective actions to be applied.	Year 2-20

Monitoring Action	Description	Frequency
Pest animal monitoring	- Pest animal monitoring will be undertaken by a suitably qualified pest management contractor in accordance with <i>Monitoring Techniques for Vertebrate Pests</i> (Mitchell and Balogh 2007) and <i>Biosecurity Act 2014</i>. - Monitoring will also consist of opportunistic observations when monitoring fences, firebreaks and access tracks. - Observations will also be recorded at the permanent monitoring transects when they are surveyed in accordance with the frequency outlined in Section 10.1. - Additional monitoring will be undertaken targeting particular pests as a corrective action in the circumstance that the monitoring detects impacts upon any MNES species (e.g. evidence of koala or squatter pigeon mortality due to wild dog attack, loss of naturally regenerating seedlings due to rabbits) or a notable increase in pest populations within/accessing the offset site. - Results from monitoring surveys will be provided in progress reporting (Section 11.0) and assess the effectiveness of pest animal control actions and inform corrective actions to be applied.	Year 1-20
Fire fuel load monitoring	- Annual inspection and maintenance of firebreaks and access tracks required to achieve compliance with the Fire Management Plan (see Section 9.5.5); - Where controlled burns are the appropriate maintenance action, burning will follow relevant RE (see Table 9.15) and undertaken in consultation with, and under the guidance of the Queensland Rural Fire Brigade and in compliance with the <i>Fire and Emergency Services Act 1990</i>. - Fuel monitoring will be undertaken annually to reduce risk of extreme fire events occurring in the offset site and inform low intensity controlled burn actions or maintenance requirements. - All firebreaks nearest the offset site will be driven and inspected annually for overgrowth with ground layer vegetation. - Results from monitoring surveys will be provided in progress reporting (Section 11.0) and assess the effectiveness of fire management actions and inform corrective actions to be applied.	Year 1-20
Dense regrowth thinning monitoring	- The growth rate of regrowth trees will be measured at representative sites to compare treated and untreated areas as per the methods of Horner et al. (2010). - Monitoring of areas where dense regrowth thinning has been undertaken will be used to check that the practice is having beneficial outcomes (in terms of vegetation community growth and structural variation and advancement) and that there are no detrimental outcomes. General observations including canopy, shrub and ground layer vegetation health and biomass will also be recorded. - Results from monitoring surveys will be provided in progress reporting (Section 11.0) and assess the effectiveness of vegetation thinning actions and inform corrective actions to be applied.	Year 1-5

10.2 Habitat condition monitoring

Permanent monitoring transects will be established in representative positions across the offset site to enable consistent reassessment of the health of the offset. Where MNES habitat overlap in monitoring sites, all applicable MNES values will be assessed. Monitoring points will be permanently marked with steel pickets and GPS location recorded. Results from this monitoring will be analysed and provided in progress reporting (**Section 11.0**).

Further detail on the monitoring assessment methods to be implemented are provided in **Table 10.2**.

Table 10.2 Habitat condition monitoring actions

Monitoring Action	Description	Frequency
Habitat condition assessment	Assessment of habitat condition will be undertaken by a suitably qualified ecologist in accordance with the Guide (DEHP 2017) and BioCondition (Eyre et al. 2015). The guide and BioCondition measures habitat quality and provides a score based on habitat and landscape features including: • Site condition – general condition (i.e. vegetation community structure and function compared to the expected range for a relatively undisturbed community); • Site context – location of the habitat within the surrounding landscape (i.e. influence of adjacent vegetation and ecological corridors); • Species habitat index – the ability of the habitat to support species. Site condition assesses the quality of the vegetation community present in the site compared to the BioCondition Benchmarks (Queensland Government 2021) whereas site context is assessed using geographic information systems (GIS) mapping and relevant spatial data. Species habitat index attributes including quality and availability of foraging and shelter habitat and species mobility capacity will be assessed consistent with the completed initial assessments. Surveys for species habitat index attributes will follow the <i>Terrestrial Vertebrate Fauna Survey Guidelines for Queensland version 3.0</i> (Eyre et al. 2018). At each representative permanent monitoring transect, habitat condition will be photo logged in accordance with methods for taking photos in BioCondition (Eyre et al. 2015) to assist in the monitoring and assessment of changes in the habitat condition over time. Photo information at each monitoring site that will be captured and logged include: • Photos (taken from 1.5 m above the ground in landscape orientation in north, east, south and west directions); • GPS location; • Date and time; • Direction (i.e. degrees); • Height above the ground; and • Monitoring Site ID. Results from monitoring surveys will be provided in progress reporting (Section 11.0).	• Annually in autumn/spring for Year 1-5; • Biannually in autumn/spring for Year 7, 9, 11 and 13; • Annually in autumn/spring for Year 15 and 20

11.0 Offset progress reporting

An annual report will be provided every five years to DAWE and published on the Karreman Quarries website. The annual report will detail the management actions and monitoring activities undertaken in the previous reporting period, and progress towards achieving offset outcomes outlined in this OMP, see **Table 12.1**. Specifically, this report will contain:

- Name and contact details of the proponent, landholders and all personnel that have been involved in management and monitoring actions in the offset site;
- Relevant EPBC approval number;
- Lot on plan property description and postal address;
- Summary of the climatic conditions at the time of management period;
- Management actions undertaken within the management period and, in the instance where corrective actions were implemented, the reasoning for this;
- Results from all baseline surveys;
- Results from monitoring surveys undertaken within the management period, including photo logs and BioCondition assessment and data;
- A comparison of the results from monitoring surveys for the current management period with the results from monitoring surveys undertaken in the previous management period;
- Any risks or potential threats observed in the management period and activities to be undertaken to control these including corrective actions to be implemented;
- Evidence of progress in achieving and/or maintaining offset outcomes and completion criteria in the form of a 'Compliance Register', including how the habitat quality scores accord with the interim performance targets;
- If any triggers were detected and, if so, the corrective actions that were implemented and their outcomes; and
- Proposed amendments to the current OMP, including recommendations and any changes to management and monitoring methods.

In addition to the above, the first annual report is to contain the following:

- The date that the offset area was registered with a voluntary declaration under the VM Act;
- The date that all entrance signs were installed, identifying the area as an environmental offset;
- The date that all barbed wire fencing and barbed wire over cyclone mesh fencing was removed from the offset area;
- The date that all fauna-friendly stock-exclusion fencing was installed in the offset area; and
- The results of the agronomic report and progress towards field seedling establishment as described in **Table 9.10**.

The final report, due 20 years after the approval of this OMP, is to assess whether the entire offset has fully achieved and maintained all completion criteria listed in this OMP (**Chapter 9**). If any completion criterion has not been achieved and maintained, additional offsets will be required to address the shortfall.

12.0 Management, monitoring and reporting schedule

12.1 Roles and responsibilities

All personnel involved are responsible for working in accordance with this OMP and are required to identify potential environmental risks and threats and implement and maintain control measures, procedures, and constraints accordingly.

12.2 Implementation schedule

Table 12.1 provides the timing of management actions, monitoring activities and reporting requirements outlined in this OMP.

Table 12.1 Management, monitoring and reporting activity schedule

Parameter	Description	Frequency and timing
Management measures		
General restrictions (signage, access tracks, gates and locks)	See Table 9.1	• Ongoing
	Repairs and maintenance	• As required based on the recommendations from annual monitoring
Fencing	Construction of new fencing	• Once in Year 1
	Repair and maintenance	• As required based on the recommendations from annual monitoring
Pest animal control	Control of relevant pest species if required (see Table 9.17)	• As required based on the recommendations from annual monitoring
Weed control	Implementation of hygiene protocols	• Ongoing
	Weed control where required	• As required based on the recommendations from annual monitoring
Fire management	Installation of new fire breaks	• Once in Year 1
	Fire break maintenance	• Annually in spring (as required based on the recommendations from annual monitoring)
	Low intensity controlled burns	• Annually, in late winter/early spring (where requisite conditions met (Section 9.5.5))

Parameter	Description	Frequency and timing
Thinning of dense regrowth stands	Cut stump herbicide treatment of a proportion of stems in areas with >4,000 stems/ha.	Annually in autumn for Year 1-5
Monitoring actions		
Fences and access tracks	Drive all offset fence lines to inspect for damage, signs of access and repair	Annually in autumn/spring
	Drive all offset access tracks	
Fire breaks	Drive all offset firebreaks	
Weeds	Baseline weed surveys	Autumn of Year 1
	Monitor existing infestations and opportunistically along access tracks, fence lines and firebreaks	Annually in autumn/spring
	Cover measurements at representative permanent monitoring transects	
Pest animals	Inspect signs of access and damage opportunistically along access tracks, fence lines and firebreaks	Annually in autumn/spring
	Weed cover measurements at representative permanent monitoring transects	
Thinning of dense regrowth	Monitoring of treated areas for beneficial and detrimental outcomes	
Habitat condition monitoring		
Habitat condition assessment	Capture current state of habitat condition using permanent transects at permanent representative locations. Includes BioCondition methodology and quality and availability of foraging and shelter habitat and species mobility capacity	- Annually in autumn/spring for Year 1-5; - In autumn/spring for Year 7, 9, 11 and 13; - In autumn/spring for Year 15 and 20
	Capture species habitat index attributes following Eyre et al. (2018) methodology.	
	Photo monitoring	
Reporting		
Progress report	Reporting of management and monitoring actions and results, and/or corrective actions if they were implemented	By end of July each year habitat monitoring is undertaken

Parameter	Description	Frequency and timing
Review of OMP	Where there has been a change recorded in management and monitoring actions, a review and amendment will be issued	As required

12.3 Failure to achieve performance triggers

In the event that an Offset Progress Report reveals a failure of the offset to achieve the relevant interim performance triggers and completion criteria listed in **Chapter 9**, the following response is triggered:

Step 1: Investigate cause of failure:

- Within one month after detecting the failure, complete an investigation into the reasons why the interim performance targets or the completion criteria were not achieved in the specified timeframes. Specifically, compare the improvements/deteriorations in raw data for each habitat attribute with the changes projected in **Section 8.3** of this OMP;
- Within two months after detecting the failure, complete a re-evaluation of the suitability of relevant management measures in the OMP. This re-evaluation must identify appropriate corrective actions. Corrective actions may include, but are not limited to:
 - A third-party review of the OMP to provide input into the effectiveness of the management actions;
 - Increasing the frequency, intensity or methods used for pest animal and weed control;
 - Supplementary enrichment planting and seeding as described in **Section 9.5** or
 - Modifying control burns to modify understorey structural attributes.

Step 2: Revise this OMP to incorporate changes to management measures identified under step 1, and submit this revised plan to DAWE for approval;

Step 3: Implementation of corrective action(s):

- The appropriate corrective actions identified under Step 1 will be implemented as soon as practicable, and in any case within six months after detection of the trigger.

13.0 Review and update of this OMP

This OMP follows an adaptive management approach and so will be reviewed and amended as required to incorporate recommendations and changes identified through management actions and monitoring activities.

Any versions of the amended OMP will be submitted to DAWE for approval.

14.0 Declaration of accuracy

I declare that to the best of my knowledge, all the information contained in, or accompanying this document is complete, current and correct.

I am duly authorised to sign this declaration on behalf of the proponent/approval holder. I am aware that:

Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading

Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.

I acknowledge that the above offences are punishable on conviction by imprisonment, a fine or both.

Signed:

EPBC Referral Number: EPBC 2020/8755

EPBC OMP

Date:

15.0 References

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