

4.3 Corrective actions

OAMP approved by DCCEEW in August of 2024. TMR has progressed critical ancillary activities to re-contract internal fire trails across Greenridge and Tabooba, totalling more than 10km. No corrective actions for the 22 August 2024 to 17 March 2025 offset reporting period.

5. Offset condition outcomes

5.1.1 Baseline conditions

For full baseline conditions of Greenridge and Tabooba, refer to Appendix 3 'Greenridge Field Assessment Results' and Appendix 2 'Tabooba Field Assessment Results' of the Offset Strategy – Coomera Connector Stage 1 Version 1 respectively (Appendix A and B).

5.1.2 Koala habitat condition

5.1.2.1 Greenridge

For full baseline conditions and methods of Koala habitat, refer to sections 3 and 4 of Appendix 3 'Greenridge Offset Property Assessment Results Coomera Connector Stage 1 – EPBC 2020/8646' of the 'Offset Strategy – Coomera Connector Stage 1 Version 1' (Appendix A).

5.1.2.2 Tabooba

For full baseline conditions and methods of Koala habitat, refer to sections 3 of and 4 Appendix 2 'Tabooba Offset Property Assessment Results Coomera Connector Stage 1 – EPBC 2020/8646' of the 'Offset Strategy – Coomera Connector Stage 1 Version 1' (Appendix B).

5.1.3 Koala and Grey-headed Flying-fox surveys

5.1.3.1 Greenridge

For baseline surveys of Koala and Grey-headed Flying-fox, refer to Section 3 of Appendix 3 'Greenridge Offset Property Assessment Results Coomera Connector Stage 1 – EPBC 2020/8646' of the 'Offset Strategy – Coomera Connector Stage 1 Version 1' (Appendix A).

5.1.3.2 Tabooba

For baseline surveys of Koala and Grey-headed Flying-fox, refer to Section 3 of Appendix 2 'Tabooba Offset Property Assessment Results Coomera Connector Stage 1 – EPBC 2020/8646' of the 'Offset Strategy – Coomera Connector Stage 1 Version 1' (Appendix B).

Appendix A: Appendix 3 – Greenridge field assessment results (offset strategy – Coomera Connector Stage 1 version 1)

APPENDIX 3

GREENRIDGE FIELD ASSESSMENT RESULTS

GREENRIDGE OFFSET PROPERTY ASSESSMENT RESULTS

COOMERA CONNECTOR STAGE 1 - EPBC 2020/8646

**Prepared for
Queensland Department of Transport and Main Road**



**Biodiversity Assessment and Management Pty Ltd
PO Box 1376
CLEVELAND 4163**



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Project Manager/s: Paulette Jones

Client: Queensland Department of Transport and Main Roads

Project Title: Greenridge Offset Property Assessment Results
Coomera Connector Stage 1 - EPBC 2020/8646

Project Author/s: Paulette Jones, Elizabeth Williams, Emma Green and David Francis.

Project Summary: Report of field assessment undertaken to assess the suitability of the Greenridge, Pimpama property for Coastal Swamp Oak Threatened Ecological Community (TEC), Koala and Grey-headed Flying-fox offsets for Coomera Connector Project Stage 1.

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Date: 30 September 2022



Managing Director

GREENRIDGE OFFSET PROPERTY

ASSESSMENT RESULTS

COOMERA CONNECTOR STAGE 1 – EPBC 2020/8646

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Table of Terms and Abbreviations

ALA	Atlas of Living Australia
AU	Assessment Unit
BAAM	Biodiversity Assessment and Management Pty Ltd
DAWE	Commonwealth Department of Agriculture, Water and Environment
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVE	Endeavour Veterinary Ecology
GCCC	Gold Coast City Council
LGA	Local Government Area
MNES	Matters of national environmental significance
PER	Public Environmental Report
RE	Regional Ecosystem
RPAS	Remotely Piloted Aircraft System
SAT	Spot Assessment Technique of Phillips and Callaghan (2011)
TMR	Queensland Department of Transport and Main Roads
VM Act	<i>Vegetation Management Act 1999</i>

1.0 INTRODUCTION

1.1 OFFSET MATTERS

The Queensland Department of Transport and Main Roads (TMR) intended to construct and operate a new 16 km high-speed arterial road between Shipper Drive, Coomera and Nerang-Broadbeach Road, Nerang called the Coomera Connector Stage 1 (the proposed action).

The proposed action was the subject of an EPBC Act referral in June 2020 (EPBC 2020/8646). The referral decision was that the proposed action is a controlled action due to likely significant impacts on:

- Ramsar wetlands;
- Listed threatened species and communities; and
- Listed migratory species.

The proposed action is to be assessed by Public Environment Report (PER).

The extent and quality of matters of national environmental significance (MNES) that would be impacted by the proposed action have been confirmed through detailed ecological surveys. The results of these surveys and subsequent impact assessment are provided in the PER. Following the application of all possible avoidance and mitigation measures, the PER identifies significant residual impact of the proposed action on 61.486 ha of Koala habitat, 56.442 ha of Grey-headed Flying-fox habitat, and 15.0131 ha of Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland threatened ecological community ('Coastal Swamp Oak TEC') and a small (<1ha) area of Subtropical and Temperate Coastal Saltmarsh ecological community from within the proposed action footprint.

As detailed in the PER, there is no Ramsar wetland present within the proposed action footprint and no significant impact is predicted for habitats of listed Migratory species and therefore no offsets are proposed for these matters.

1.2 PURPOSE OF THIS REPORT

Biodiversity Assessment and Management Pty Ltd was commissioned by TMR to assess an Offset Investigation Area to inform the proposed action Offset Strategy. This report provides the results of surveys to determine the suitability of the Greenridge Offset Investigation Area to provide offsets for proposed action impacts to Koala *Phascolarctos cinereus* (EPBC Act Endangered – vulnerable at the time of the controlled action decision), Grey-headed Flying-fox *Pteropus poliocephalus* (EPBC Act Vulnerable) and Coastal Swamp Oak TEC (EPBC Act Endangered).

1.3 OFFSET SITE SELECTION

Relevant literature was reviewed to determine habitat types that are suitable for Koala and Grey-headed Flying-fox, and Coastal Swamp Oak TEC. Grey-headed Flying-fox habitat includes rainforest, mangroves and cultivated areas in its foraging options, and both Grey-headed Flying-fox and Koala forage in open forests and woodlands dominated by eucalyptus species. Communities of Coastal Swamp Oak occur typically in coastal catchments where soils are at least occasionally saturated, water-logged or inundated and typically where groundwater is saline or brackish. The TEC in Queensland is also known to occur as part of a mosaic habitat within RE 12.3.20 which also comprises foraging resources for both Koala and Grey-headed Flying-fox.

Potential offset properties/habitat were identified using the following criteria:

- Properties located within the same bioregion as the impact area and as close to the proposed action corridor as possible.

- Land owned by the Queensland Government, in private ownership but not under conservation, or properties for sale on the open market.
- Land supporting habitats suitable for Koala, Grey-headed Flying-fox, and Coastal Swamp Oak TEC.
- The presence of past records of Koala, Grey-headed Flying-fox, and Coastal Swamp Oak TEC within or near Greenridge.
- Properties positioned in the landscape such that habitat restoration would provide a conservation outcome for the MNES (e.g. connecting and/or supplementing existing Koala habitats and Coastal Swamp Oak TEC, and within 20 km of a nationally significant Grey-headed Flying-fox roost).
- Land supporting habitats that are not protected under state legislation from clearing or other uses not compatible with conservation of the protected matters.
- Land supporting habitats that have been significantly cleared or degraded, and where habitat restoration would achieve a conservation outcome for the protected matters.
- Properties of a size that would accommodate a significant proportion of the required offsets for Koala, Grey-headed Flying-fox, and Coastal Swamp Oak TEC to facilitate focused application of offset management actions.

Regional Ecosystem (RE) mapping describes the dominant canopy species present within each map unit and provides a tool for determining where suitable forage tree species for Koala and Grey-headed Flying-fox and potential patches of Coastal Swamp Oak may occur. Suitable habitat for both Koala and Grey-headed Flying-fox was determined based on identifying areas with significant and key food sources for both species.

In particular, for Koala, suitable habitat was considered to be:

- REs that are ranked as either 'Medium' or 'High' suitability in the report *Spatial modelling for koalas in South East Queensland v2.0* (DES 2021);
- REs with $\geq 50\%$ dominant or subdominant tree species described in the *Draft National Recovery Plan for the Koala* (DAWE 2021a) as important in the north (i.e. in Queensland); or
- REs with $\geq 50\%$ dominant or subdominant tree species listed in scientific publications as Koala habitat in areas between central Queensland to central New South Wales, including:
 - *Ranking and mapping Koala habitat quality for conservation planning on the basis of indirect evidence of tree species use: A case study of Noosa Shire, south-eastern Queensland* (Callaghan et al., 2011),
 - *Tree use, diet and home range of the Koala (Phascolarctos cinereus) at Blair Athol, central Queensland* (Ellis et al. 2002),
 - *The habitat and diet of koalas (Phascolarctos cinereus) in Queensland* (Melzer et al. 2014),
 - *Tree use by Koalas (Phascolarctos cinereus) after fire in remnant coastal rainforest* (Matthews et al., 2007).

For Grey-headed Flying-fox, suitable habitat was considered to be:

- REs with $\geq 50\%$ dominant or subdominant vegetation species that are listed in *Ranking the feeding habitats of Grey-headed Flying-fox for conservation management* (Eby and Law 2008) as significant flowering or fruiting species; or
- REs with $\geq 50\%$ dominant or subdominant vegetation species that are listed in the *National Recovery Plan for the Grey-headed Flying-fox* (DAWE 2021) as important winter and spring food trees.

For Coastal Swamp Oak TEC, suitable habitat was considered as the two Regional Ecosystems known to support the ecological community in Queensland from the Conservation Advice (Department of the Environment and Energy 2018):

- RE 12.1.1 (*Casuarina glauca* woodland on margins of marine clay plains) (listed as 'of concern'); and
- RE 12.3.20 (*Melaleuca quinquenervia*, *Casuarina glauca* +/- *Eucalyptus tereticornis*, *E. siderophloia* open forest on low coastal alluvial plains) (listed as 'endangered'), in areas where the canopy is dominated by *Casuarina glauca* (Department of the Environment and Energy 2018).

The REs determined to be suitable habitat for Koala, Grey-headed Flying-fox and Coastal Swamp Oak TEC were used to spatially map vegetation and identify suitable properties, and the areas within properties, that had potential to meet offset requirements for each MNES.

Offset opportunities were sought as close as possible to the impact within the City of Gold Coast local government area (LGA). The 407 ha property known as 'Greenridge' off Green Meadows Road, Pimpama was identified as a suitable offset property and has been subject to the detailed assessment reported herein.

1.4 PROPOSED OFFSET PROPERTY LOCATION

Greenridge is located at 108 Green Meadows Road, Pimpama, approximately 3.5 km northeast of the northern extent of the proposed action (Figure 1.1). Greenridge covers 407 ha in total and is comprised of 12 lots:

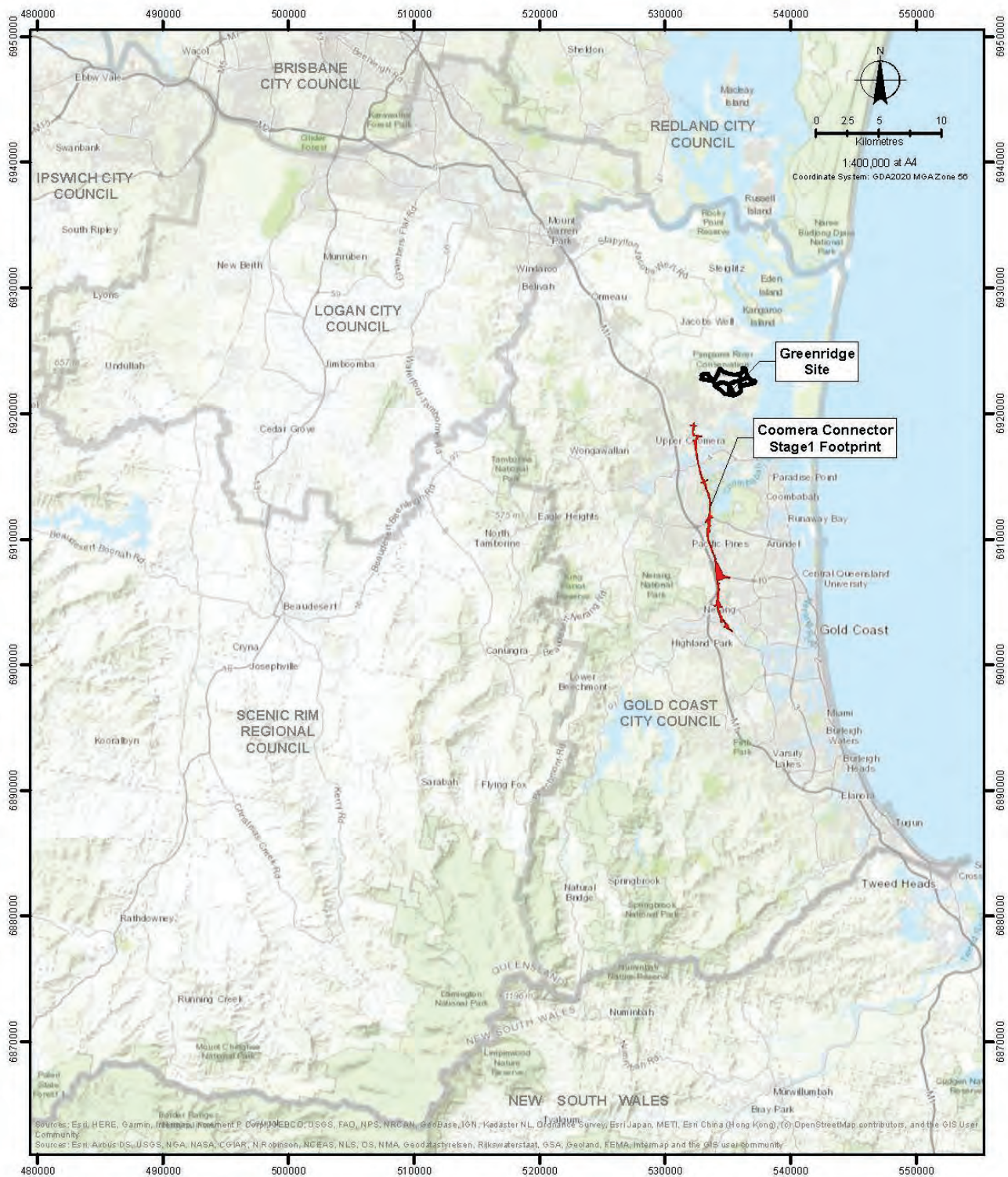
- Lot 121 on RP903491 (28.43 ha)
- Lot 15 on SP145312 (62 ha)
- Lot 6 on RP50178 (60.57 ha)
- Lot 7 on RP50178 (26.69 ha)
- Lot 8 on RP50178 (37.69 ha)
- Lot 11 on RP50178 (15.68 ha)
- Lot 12 on RP50178 (16.28 ha)
- Lot 13 on RP50178 (54.6 ha)
- Lot 14 on RP50178 (19.98 ha)
- Lot 15 on RP50178 (40.65 ha)
- Lot 16 on RP50178 (14.37 ha)
- Lot 71 on W31402 (30.35 ha).

2.0 PROPERTY DESCRIPTION

2.1 LOCALITY FEATURES AND CLIMATE

Greenridge is located in the Gold Coast City LGA suburb of Pimpama. It is situated at the southern-most extent of a broader >100 km² area of agricultural land that exists between the Logan River in the north and McCoys Creek in the south. Agricultural land uses in the broader area are dominated by sugar cane production. Also present are extractive industries, including sand mining and hard rock quarrying, along with aquaculture enterprises and facilities for boating. This area is bound to the west by the Pacific Motorway (M1), which is adjoined by industrial and residential development. The eastern boundary is the southern extent of Moreton Bay including the Moreton Bay Ramsar Wetland, and there are patches of remnant vegetation along the coastline and associated with inlets, rivers and creeks. New residential developments are beginning to emerge along the coastline. Much of the area is less than 10 m above sea level.

Figure 2.1 shows the location of Greenridge between McCoys Creek in the south and the Gold Coast City Council Pimpama River Conservation Area in the north. Its eastern boundary is formed by the Pimpama River and lands associated with a Gold Coast City Council sewage treatment plant and a nature reserve are located to the west.



- Greenridge site
- Impact site
- LGA boundaries

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 Drawn By: KM Reviewed by: PJ Date: 28/07/2022

Figure: 1.1

Title: Locality Map

Project: Greenridge Offset Property Assessment Results
 Coomera Connector Stage 1 – EPBC 2020/8646

Client: Queensland Department of Transport and Main Roads



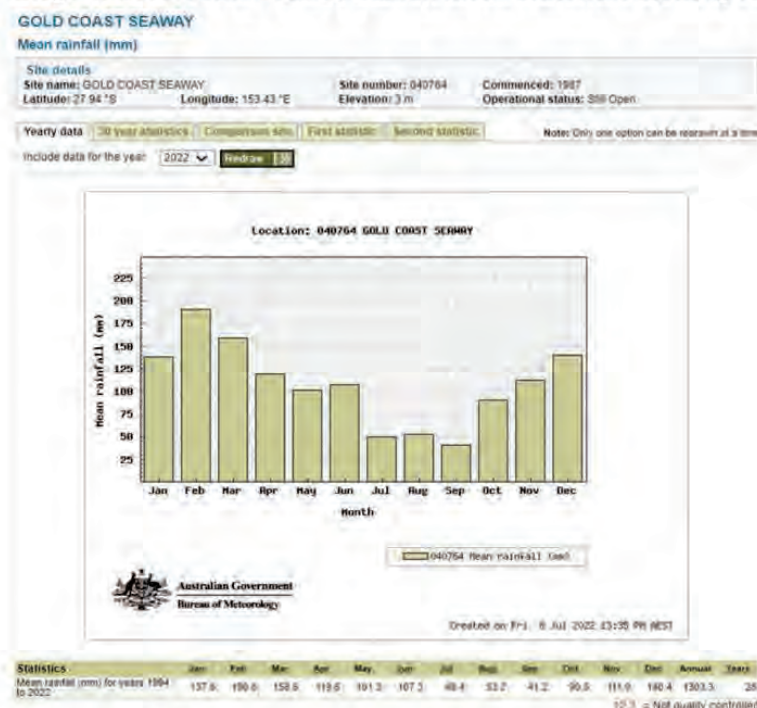
The central to southern portions of Greenridge contains small ridges and hills up to 20 m above sea level and composed of sandy clays to stony lithosols derived from Neranleigh-Fernvale beds with colluvial deposits at the base of slopes. These higher areas are characterised by open eucalypt woodland supporting Koala and Grey-headed Flying-fox habitat.

The north-east and north-west of Greenridge consist predominately of alluvial plains supporting a network of shallow alluvial channels draining into the Pimpama River and McCoys Creek. This area is comprised of poorly drained clays to sandy clays, derived from river alluvial, beach and estuarine sediments and supports a mosaic of aquatic and terrestrial vegetation types typical of low-lying coastal areas.

A considerable portion of Greenridge has been cleared in the past for agricultural purposes.

The closest weather station to Greenridge is Gold Coast Seaway Station (040764), approximately 15 km away, and has been operational since 1987. At this station mean annual rainfall is 1303.3 mm/year and mean monthly rainfall is as shown in Image 1. Mean maximum temperature is 25.3°C, ranging from 28.8°C in January to 21.3°C in July. The highest maximum temperatures were above 30°C in the months from December to February.

Image 1. Gold Coast Seaway Station Mean Maximum Monthly Rainfall Totals



2.2 MANAGEMENT HISTORY

The earliest available aerial imagery (from 1955) indicates the north-western portion of Greenridge was historically cleared of vegetation to facilitate sugarcane farming (Image 2). Broad-scale and selective vegetation clearance continued into the central and southeastern portion of Greenridge for cattle-grazing and establishment of small-scale slash pine plantations as shown in the 1971 aerial photograph (Image 3). Sugar-cane production appears to have ceased between 1978 and 1985. By 1989 (Image 4) Greenridge was being managed primarily for cattle grazing and slash pine plantation, as well as for recreational use by light aircraft. All vegetation on Greenridge was either cleared or substantially thinned and cattle grazing has been the predominant use to recent times.

Image 2. 1955 aerial photography (source: QImagery)

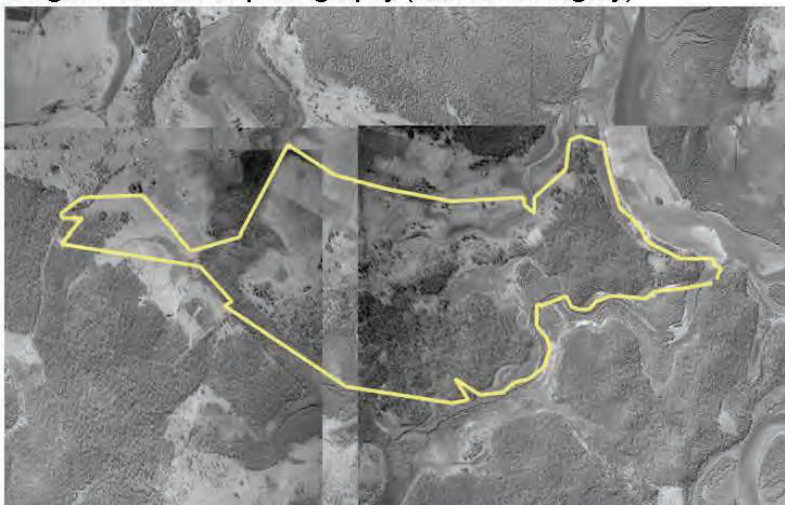


Image 3. 1971 aerial photography (source: QImagery)



Image 4. 1989 aerial photography (source: QImagery)



In addition to historical broadscale clearing causing major changes to the landscape, areas once mapped as marine-influenced RE 12.1.1 have been significantly altered due to the suppression of tidal inundation from the installation of tidal gates at Kerkins Road and Green Meadows Road (**Photo 1**) which close at high tide and open (drain) at low tide. This has led to a greater retention of freshwater runoff and establishment of freshwater wetland habitat within the western portion of Greenridge (**Photo 2**).

Photo 1: Tidal gate located on Green Meadows Road



Photo 2: Freshwater wetland in RE12.1.1



Though most recently used for cattle grazing, Greenridge does not exhibit any signs of recent cattle usage. Pasture dominated by the exotic South African Pigeon Grass *Setaria sphacelata* is heavily overgrown and infested with Fireweed *Senecio madagascariensis* (toxic to livestock) indicative of little pastoral management. Fencing has also been removed from areas once restricting cattle access to saltmarsh and mangrove communities in the central to southern portions of Greenridge.

Historical logging/thinning in forested areas of Greenridge is evident with large stumps remaining in place of removed trees. Weed proliferation is apparent throughout Greenridge with sporadic

infestations of dense Lantana and Groundsel cover. It is unknown what, if any, fire management practices were historically employed on Greenridge; however, it appears that there has been no recent management to prevent wildfire, or any other vegetation management measures implemented in recent years.

In addition to significant pest plant proliferation in parts of Greenridge, signs of invasive fauna - specifically Feral Pigs and European Foxes - were observed on Greenridge, evidenced by characteristic diggings and tracks. Pig diggings appeared to be concentrated beneath *Casuarina glauca* as illustrated in **Photos 3-5**. *Casuarina glauca* is known to fix atmospheric nitrogen in root nodules through actinorhizal associations with *Frankia* spp. bacteria (Hammerton 2001). As the evidence of pig diggings throughout Greenridge was concentrated in areas of *Casuarina glauca* it is possible that feral pigs search out the nitrogen and amino acid-rich nodules, in addition to fruiting bodies produced by mycorrhizal fungi, as valuable protein resources as is common for browsing and grazing animals in forested habitats (Maser *et al.* 2008). Insufficient information is available to determine whether any pest-animal management has historically been carried out on Greenridge, but increased numbers of Feral Pigs on the Gold Coast have been reported in recent years attributed to higher rainfall in the region and are thought to be breeding in vegetation along the Pimpama River (Sheehan and Forbes 2021).

Photos 3-5: Feral pig diggings beneath and surrounding *Casuarina glauca*



2.3 COASTAL SWAMP OAK IN THE LANDSCAPE

In South East Queensland, *Casuarina glauca* occurs in almost monospecific stands as woodland on the margins of marine clays pans (RE 12.1.1) and in an open forest mosaic with *Melaleuca quinquenervia*, with or without *Eucalyptus tereticornis* and *E. siderophloia*, on low coastal alluvial plains (RE 12.3.20). Clearing for agricultural and urban purposes on the coastal plain has significantly reduced the area of these communities on the western shores of Moreton Bay.

Accurate representation of the distribution of the TEC is difficult to determine as patches of RE 12.1.1 are often too small to map at the State mapping scale, and its occurrence within RE 12.3.20 can only be determined by field verification.

Local distribution of these REs from State mapping for Greenridge and surrounds is shown on Figure 2.2.

2.4 KOALAS IN THE LANDSCAPE

2.4.1 Koala records and activity levels

The Atlas of Living Australia (ALA) provides publicly available location data for species, including those records held by the Queensland Government. Figure 2.3 shows the locations of ALA Koala records within 10 km of Greenridge. Koala records in the locality have been numerous over the years of data collection, including within areas where habitat has since been cleared for residential and other developments – particularly within the area between the Coomera River and McCoys Creek. Koalas in this location are now largely confined to residual bushland patches and narrow habitat corridors through residential areas. There is some habitat connection from this area to the Greenridge property via mostly freehold land, and Greenridge provides opportunity for a viable connection of habitats between the Coomera River and the Pimpama River Conservation Area.

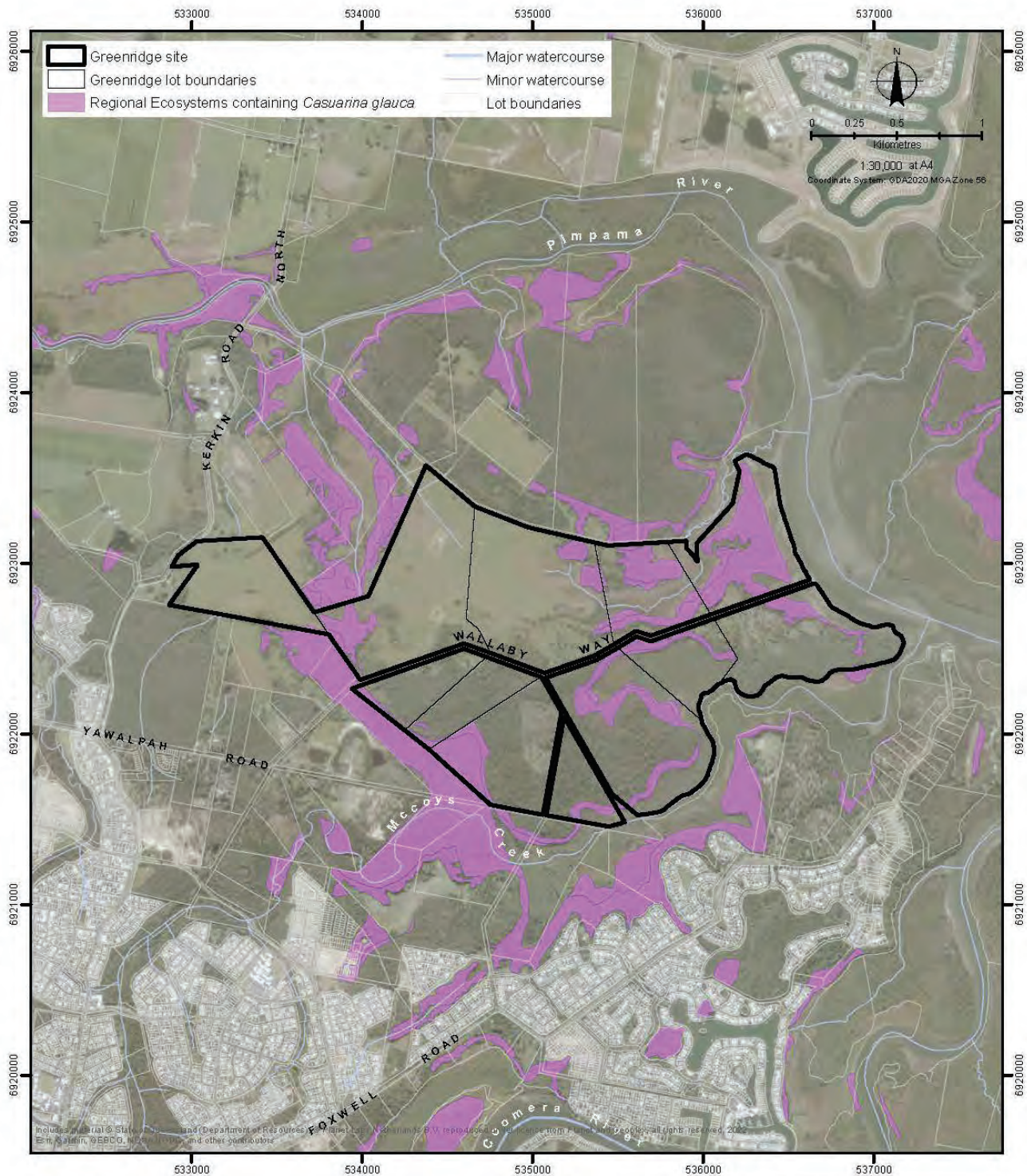
EVE (2020) carried out a Comprehensive Koala Survey for the Coomera Connector Stage 1. The study identified the Pimpama River Conservation Area and the Pimpama Conservation Park as suitable recipient locations for Koala translocation and also addressed the suitability of Greenridge for this purpose. The report recommended capture, tagging and longitudinal monitoring (for at least 6 months) of resident Koalas and risks in the location, including chlamydial disease and wild dog predation. This work is currently ongoing.

In 2021, Planit Consulting prepared the plan, provided here as Image 6, to advise TMR of the Koala activity results of previous studies on Greenridge and surrounds. These studies include Koala sightings from the EVE (2020) study, as well as publicly available Koala records and sightings, including Koala hospital data. The results of 2007, 2017 and 2020 SAT surveys are also shown. 2017 SAT surveys indicated high-medium Koala activity for all terrestrial habitats in Greenridge.

2.4.2 Habitat suitability and connectivity

Existing regional ecosystem mapping for Greenridge is shown on Figure 2.4, indicating the presence of remnant REs 12.11.23, 12.3.20, and 12.3.5 on Greenridge. 'Core' Koala habitat is mapped over these REs on Greenridge, which adjoins other areas of Core Koala Habitat external to Greenridge boundary to the north and south west. The southern portion of Greenridge intercepts a mapped 'Statewide biodiversity corridor' and the north-eastern tip of Greenridge adjoins the 'Statewide riparian corridor' associated with the Pimpama River.

RE 12.11.23 is described as *Eucalyptus pilularis* open forest on coastal metamorphics and interbedded volcanics. Other canopy species include *E. microcorys*, *Corymbia intermedia*, *Angophora woodsiana*, *E. tindaliae* and *E. carnea*. Occurs on low coastal Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. A 'special value' of the RE from the RE description is that it is known to provide suitable habitat for Koalas (Queensland Government <https://apps.des.qld.gov.au/regional-ecosystems/details/?re=12.11.23>). Consideration of the dominant canopy species indicates the RE has high value for Koala (DES 2021).



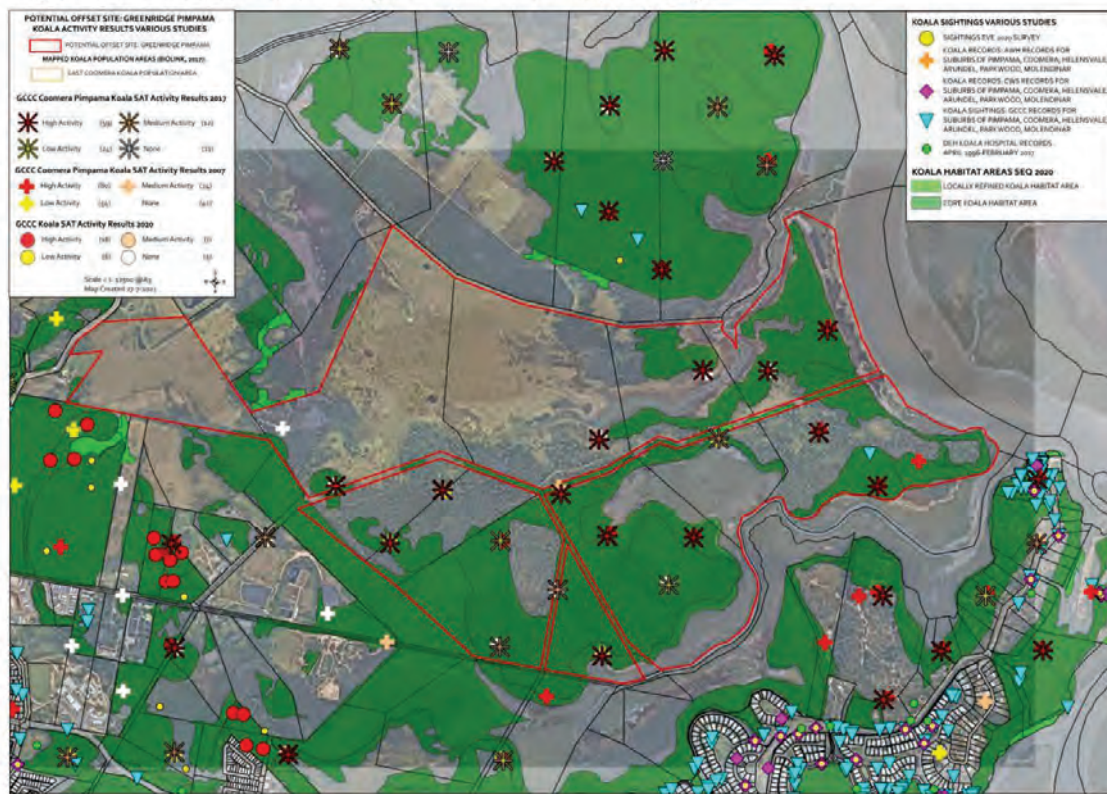
Data sources:
 Cadastral data - Queensland - by area of interest, Published 30/05/2022
 Vegetation management regional ecosystem map - v12.00, Published 04/05/2022
 Vegetation management watercourse and drainage feature map (1:25000) - South East Queensland v5.0, Published 08/09/2021
 Baseline roads and tracks - Queensland, Published 31/03/2022
 State of Queensland (Department of Resources)

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 Drawn By: KM Reviewed by: PJ Date: 30/07/2022

Figure: 2.2
Local occurrence of
Regional Ecosystems containing
Casuarina glauca
Title:
Greenridge Offset Property
Assessment Results
Project:
Coomera Connector Stage 1
- EPBC 2020/8646
Client:
Queensland Department of
Transport and Main Roads



Image 6. Results of Previous Koala Surveys within and surrounding Greenridge



RE 12.3.20 is described as *Melaleuca quinquenervia*, *Casuarina glauca* +/- *Eucalyptus tereticornis*, *E. siderophloia*, *M. styphelioides* open forest on low coastal alluvial plains. Occurs on lowest terraces of Quaternary alluvial plains in coastal areas. A 'special value' of the RE in the RE description is that it is known to provide suitable habitat for Koalas (Qld Government <https://apps.des.qld.gov.au/regional-ecosystems/details/?re=12.3.20>). Consideration of the dominant canopy species indicates the RE has medium value for Koala (DES 2021).

RE 12.3.5 is described as *Melaleuca quinquenervia* open forest on coastal alluvium. Other tree species that may be present as scattered individuals or clumps include *Lophostemon suaveolens*, *Eucalyptus robusta*, *E. tereticornis*, *E. bancroftii*, *E. latissinensis*, *Corymbia intermedia*, *Melaleuca salicina*, *Livistona australis*, *Casuarina glauca*, and *Endiandra sieberi*. Occurs on Quaternary alluvium in coastal areas. A 'special value' of the RE in the RE description is that it is known to provide suitable habitat for Koalas (Qld Government <https://apps.des.qld.gov.au/regional-ecosystems/details/?re=12.3.5>). Consideration of the dominant canopy species indicates the RE has medium value for Koala (DES 2021).

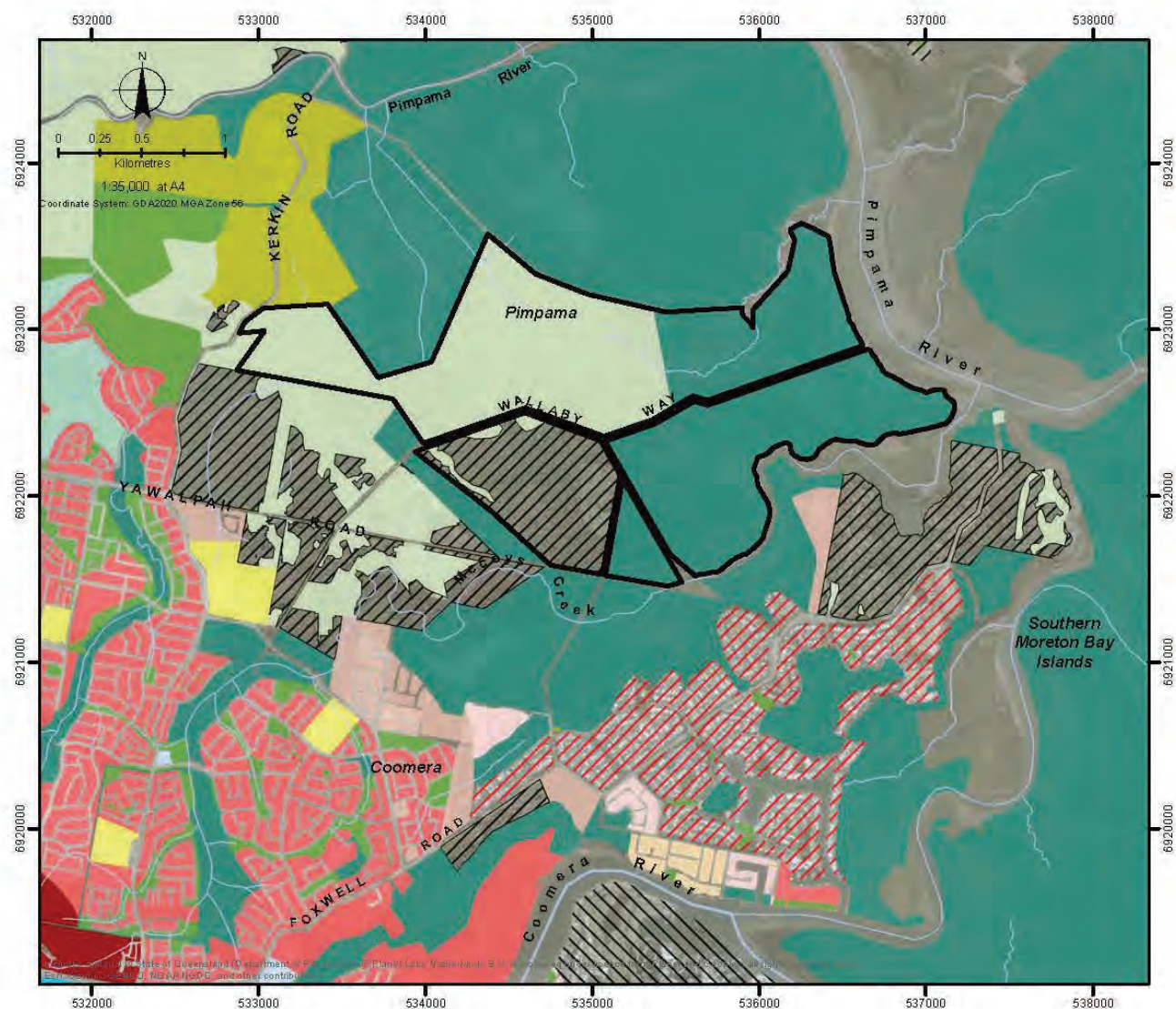
The ecological values of portions of Greenridge are recognised in the Gold Coast City Plan (Figure 2.5), where the eastern half of Greenridge is zoned for Conservation and forms part of a broader conservation node. The eventual inclusion of an additional 150 ha of currently 'Rural' zoned land on Greenridge into this conservation node in the form of offsets for Koalas and other matters would increase available habitat for Koalas. For the entire site, including those locations currently supporting remnant and regrowth vegetation, management as offset habitat would implement long-term measures to reduce threats to Koalas, such as controlling European Foxes and wild dogs and managing Lantana where it is a barrier to Koala movement and a risk for uncontrolled bushfire.

Movement of Koalas between Greenridge and the adjacent state-mapped 'Core' Koala habitat in the 355 ha Pimpama River Conservation Area (PRCA) to the north (Figure 2.1) is known anecdotally. A tributary of the Pimpama River which separates vegetated eastern and central portions of Greenridge from the PRCA, confines Koala movement between these areas to the terrestrial habitats in the western portion of Greenridge. At present, the cleared paddocks in the western portion are mostly treeless and support long pasture grasses and dense *Setaria sphacelata*, which may discourage Koala movement though these areas. The western boundary of Greenridge is adjacent to the 14 ha Pimpama Conservation Park, the 5 ha Wallaby Way Reserve, partly treed land zoned for rural uses and a local government sewerage treatment facility, which are ultimately connected to the PRCA and likely form the predominant passage between Greenridge and the PRCA for Koalas.

Future restoration of Koala habitat in cleared portions of Greenridge would significantly improve connectivity between exiting remnant habitat and the PRCA.

McCoys Creek on the southern boundary of Greenridge supports dense mangroves and expanses of saltmarsh vegetation that would restrict Koala movement to the south.

Figure 2.4. Regional Ecosystems, Queensland Koala Habitat Mapping and Biodiversity Corridors



Gold Coast City Council - City Plan Zones

	Low density residential		Sport and recreation		Rural, Rural landscape and environment precinct
	Low density residential, Calypso Bay precinct		Open space		Rural residential, Rural residential landscape and environment precinct
	Low density residential, Large lot precinct		Conservation		Special purpose
	Medium density residential		Community facilities		Special purpose, Special development areas precinct
	High density residential		Emerging community		Township
	Neighbourhood centre		Innovation		
			Rural		

Greenridge site
 Major watercourse
 Minor watercourse

Data sources:
City of Gold Coast Plan v8
Gold Coast City Council
Vegetation management watercourse and drainage feature map (1:25000) – South East Queensland v5.0, Published 08/09/2021
Baseline roads and tracks - Queensland, Published 31/03/2022
State of Queensland (Department of Resources) 2022

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Drawn By: KM Reviewed by: PJ Date: 29/07/2022

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Figure: 2.5

Title: Gold Coast City Plan Land Uses

Greenridge Offset Property
Assessment Results
Project: Coomera Connector Stage 1
– EPBC 2020/8646

Client: Queensland Department of
Transport and Main Roads



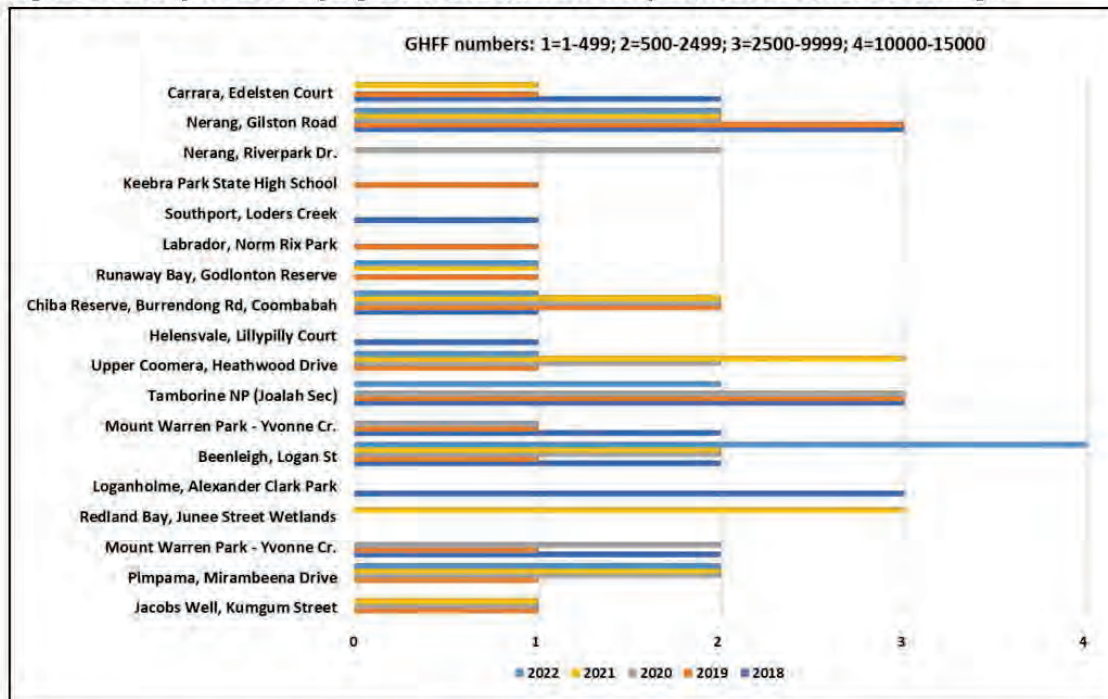
2.5 GREY-HEADED FLYING-FOX IN THE LANDSCAPE

ALA database records for Grey-headed Flying-fox in the landscape are shown on Figure 2.6, along with the locations of known flying-fox camps supporting Grey-headed Flying-fox as indicated in data sourced from the National Flying-fox Monitoring Viewer (<http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>).

The number of Grey-headed Flying-fox records shown on Figure 2.6 is not expected to represent the full distribution of the species in the landscape as they are active nocturnally, often in extensive and inaccessible woodlands and forests in response to flowering events.

At night, Grey-headed Flying-foxes typically feed on blossoms and fleshy fruits within 20 km of their roosts (although they can travel as much as 50 km), feeding in remnant forest, patches of vegetation on cleared land and urbanised areas (Roberts *et al.*, 2012). Habitats of Greenridge are within the typical foraging distance of the 21 camps shown on Figure 2.6, which includes the Nationally Important Flying-fox camp at Carrara, Edelsten Court, which is just outside of the 20 km radius of Greenridge. Figure 2.7 shows the number of Grey-headed Flying-foxes recorded at these camps over the past five years. The most active camps have been Beenleigh, Logan Street (10,000-15,000 recorded in 2022), Tamborine National Park (500-9,999 recorded on four survey years from 2018 to 2022) and Nerang, Gilston Road (500-9,999 recorded each year from 2018 to 2022). The camp at Chiba Reserve at Coombabah has also had Grey-headed Flying-fox consistently present in the past five years.

Figure 2.7. Grey-headed Flying-fox numbers from camps within 20 km of Greenridge.



Consideration of the dominant canopy species within the REs present (Figure 2.4) indicates REs 12.3.5, 12.3.20 and 12.11.23 have high value for Grey-headed Flying-fox, attributed to the dominance of winter-flowering canopy species (DAWE 2021, Eby and Law 2008).

During a Koala survey of Greenridge conducted by ddwfauna for Titanium Enterprises Pty Ltd in 2006, Grey-headed Flying-foxes were reported to be widespread throughout vegetated areas and were observed feeding on *E. tereticornis* and *M. quinquenervia*.

3.0 ASSESSMENT METHODS

3.1 HABITAT QUALITY ASSESSMENT

To assess the suitability of Greenridge for Coastal Swamp Oak and Koala, habitat assessment has been undertaken by applying the methods of the *Guide to Determining Terrestrial Habitat Quality – Version 1.3* (Queensland Government 2020) in line with the habitat assessments undertaken at the Coomera Connector Stage 1 impact area for Koala (Planit 2021a) and Coastal Swamp Oak TEC (Planit 2021b).

Additional assessment has been undertaken for Koalas and Grey-headed Flying-fox as described in **Sections 3.2 and 3.3**.

3.2 KOALA SURVEYS

This report provides the results of spot assessment surveys after the Spot Assessment Technique (SAT) of Phillips and Callaghan (2011) to measure localised levels of habitat use by Koalas, and Strip Transects in general accordance with Dique *et al.* (2003) to gather baseline Koala density data.

A thermal-imaging drone Koala survey by Endeavour Veterinary Ecology (EVE 2022) (Appendix 1) contributes significantly to understanding Koala distribution and Koala density for Greenridge.

3.2.1 Spot Assessment Technique (SAT) surveys

Seven SAT surveys were carried out on Greenridge over 30 June, 1 July, 27 July and 3 August 2022. Two of these, undertaken on 27 July and 3 August (locations shown on Figure 4.1), are reported as these were the only sites relevant to a proposed Stage 1 Koala offset Assessment Unit.

The SAT of Phillips and Callaghan (2011) involves a radial assessment within the immediate area surrounding a tree of any species that is known to have been utilised by the species, or otherwise considered to be of some importance to Koala. To apply the SAT, the following technique was applied:

1. Location and marking of a tree (the centre tree) that met one or more of the following selection criteria:
 - a. a tree of any species beneath which one or more Koala faecal pellets have been observed and/or
 - b. a tree in which a Koala has been observed and/or
 - c. any other tree known or considered to be potentially important for Koala, or of interest for other assessment purposes.
2. identify and uniquely mark the 29 nearest trees to the centre tree,
3. undertake a search for Koala faecal pellets beneath each of the 30 marked trees based on a cursory inspection of the undisturbed ground surface within a distance of 100 centimetres around the base of each tree, followed (if no faecal pellets are initially detected) by a more thorough inspection involving disturbance of the leaf litter and ground cover within the prescribed search area.

The field team inspected individual trees that were considered likely to be used by Koalas showing evidence of scratches and/or faecal pellets. Where signs of Koala were not evident, centre trees for the surveys were selected based on their size and known value as Koala forage or shelter species.

3.2.2 Koala Strip Transect Surveys

Seven strip transect surveys were carried out on Greenridge over 30 June, 1 July and 27 July 2022. Two of these, undertaken on 27 July and 3 August (locations shown on Figure 4.1), are reported as these were the only site relevant to a proposed Stage 1 Koala offset Assessment Unit.

Strip-transect surveys were undertaken using a method modified from Dique *et al.* (2003). This involved selecting a random start-point from which a 100m tape was laid out in a straight line following a fixed bearing and an area 25m wide on each side of the tape (100m x 50m total) was searched for Koalas. Each search was carried out by two experienced observers spaced about 10m apart and, with the aid of binoculars, traversed one side of the tape from the starting point to the end and then returned along the other side of the tape inspecting all tree canopies for Koalas. Using this method, Koala sightings are recorded and density estimates are made based on the number of Koalas observed per hectare of area searched.

3.2.3 Additional Data from BioCondition Transects

Additional data were collected during field surveys to inform habitat quality scoring parameters for MNES not captured using the standard BioCondition method. These included the following based on the relevant MNES:

1. Koala tree canopy cover

When assessing the quality of food and foraging habitat for koala using the scoring method applied in the Impact Area Assessment prepared by Planit (2021a), it was necessary to record the proportion of canopy cover comprised of koala food tree species known to support koalas within the region.

Gold Coast City Council identify the following species as diet species for Koala in the region (from: <https://www.goldcoast.qld.gov.au/Council-region/About-our-city/Environment-sustainability/About-our-environment/Native-animals/Koalas>)

Preferred koala food trees:

- forest red gum or Queensland blue gum (*Eucalyptus tereticornis*)
- tallowwood (*E. microcorys*)
- swamp mahogany (*E. robusta*)
- grey gums (*E. propinqua* and *E. biturbinata*).

Important local supplementary food sources:

- narrow-leaved red gum (*E. seeana*)
- white stringybark (*E. tindaliae*)
- red mahogany (*E. resinifera*)
- brush box (*Lophostemon confertus*)
- broad-leaved paperbark (*Melaleuca quinquenervia*).

The City of Gold Coast Koala Conservation Plan states that many other species are known to be utilised by Koala. An In-situ monitoring program at East Coomera during 2007-2014 identified Koalas using more than 40 tree species including those of the genera *Eucalyptus*, *Corymbia*, *Melaleuca*, *Lophostemon* and *Angophora*; however, it is unclear which species, if any, are utilised solely for shelter as opposed to constituting diet (Gold Coast City Council 2018). Based on the REs recorded on the Greenridge property that are known to provide suitable habitat for Koalas and are dominated by recognised Koala food trees, species from any of the above genera have been counted as potential Koala food trees for the purposes of this assessment.

Standard BioCondition surveys record canopy cover by measuring the vertical projection of canopy intercepting a 100m transect line (Eyre *et al.* 2015). To capture the proportion of the canopy comprised of Koala food trees, these species were distinguished separately from other

canopy species when recording canopy cover over the 100m transect. Distances of the Koala tree canopies over the 100m transect were summed and then calculated as a proportion of the total canopy cover (Koala tree cover plus non-Koala tree cover, less any overlaps).

2. *Casuarina glauca* canopy cover

Using the same method described above for Koala tree canopy cover, the proportion of *Casuarina glauca* cover for some transects was also recorded to assist in identifying patches of Coastal Swamp Oak that would qualify as the TEC.

3. Grey-headed Flying-fox foraging tree abundance

Included in the impact site Grey-headed Flying-fox habitat assessment performed by Planit (2021b), the abundance of foraging trees and significant foraging trees as documented within Eby and Law (2008), Eby *et al.* (2019) and DAVE (2021) was recorded at each BioCondition plot by counting all foraging trees within the T1 canopy layer of the 50m x 100m plot.

With an understanding that Grey-headed Flying-foxes forage in both the canopy and sub-canopy, all trees identified as foraging species from the above referenced literature with a DBH $\geq 10\text{cm}$ and $\geq 2\text{m}$ tall was included in the stem counts used in assessing foraging tree abundance at the Greenridge property. These trees were counted within the 50m x 100m BioCondition plots by taking a tally for each identified forage species. In plots where trees were particularly dense throughout Greenridge, a subset was counted in the 50m x 20m sub-plot to save time and avoid double-counting trees. These tallies were used to estimate the stem-density per hectare of each forage tree species within each site to be used in the assessment of foraging tree abundance.

3.2.4 Thermal imaging drone survey

Thermal-imaging drone surveys of the Pimpama River Conservation Area and Greenridge were conducted by EVE over 13 nights from 2 December 2021 to 10 February 2022, with six of those nights focused on Greenridge.

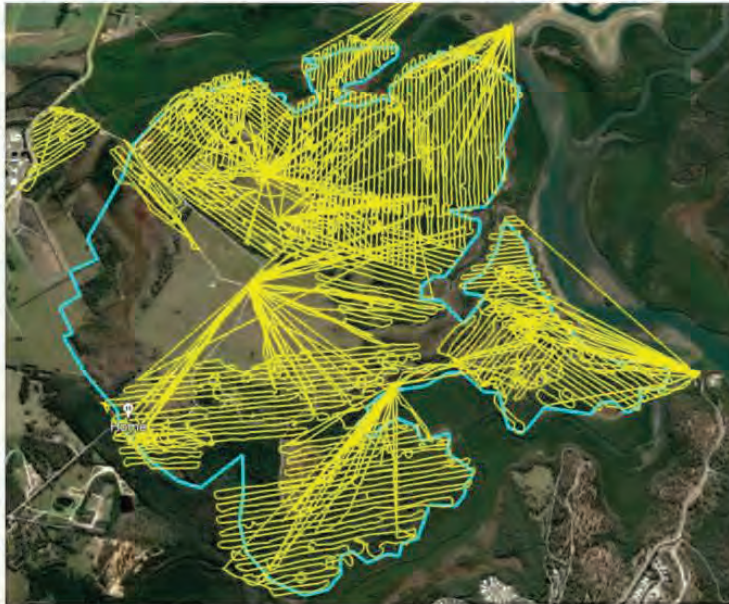
All areas of Koala habitat were surveyed, except for two small areas on Greenridge (approximately 9.5 ha in total) where site terrain made it difficult to maintain visual line of sight of the drone (a Civil Aviation Safety Authority requirement). The area was divided into six discrete search polygons and each area was systematically searched in an 'up-and-back' lawn-mower pattern using a Matrice 300 RTK (M300) with H20T camera (dual optical and thermal). Thermal heat signatures suggestive of Koalas were investigated to positively identify the origin of the heat source. Where a Koala was identified, the location of the Koala was determined using a laser rangefinder and the GPS coordinates recorded in a spreadsheet and a reference screen shot of the Koala with the coordinates was saved. Coordinates and drone flight paths were plotted on Google Earth and any obvious duplicate detections were deleted. Image 7 shows the drone survey flight paths for the survey period.

While relying on thermal imagery to detect potential Koalas, the photography component of the method minimises the opportunity for false positive or negative detection, which has been a particular issue when using thermal imaging for Koala detection (Corcoran *et al.* 2019; Hamilton *et al.* 2020).

In a test of the accuracy of remotely piloted aircraft system thermal imaging (RPAS) against traditional spot lighting and SAT surveys, Witt *et al.* (2020) found that RPAS coupled with thermal imaging cameras proved to be a promising efficient and effective alternative method to systematic spotlighting and the SAT surveys for detecting koalas and estimating density at low density sites in the winter period (when heat signatures are most easily detected).

In terms of direct detection Witt *et al.* (2020) reported that RPAS detected one Koala per 2.18 hrs compared with one Koala per 6.75 hrs for spotlighting and one Koala per 43.39 hrs for SAT surveys, proving the efficiency of RPAS. Additionally, their work showed that with repeat surveys at low density sites, RPAS was the optimal method for direct detection of individual Koalas ($n = 11$ of 12), compared to Spotlight ($n = 4$ of 12) and the SAT ($n = 1$ of 12), while the SAT method remains optimal for determining site occupancy given the value in confirming transient Koala habitat.

Image 7. Thermal Koala survey flight paths (EVE 2022)



3.3 GREY-HEADED FLYING-FOX SURVEYS

No flying-fox camps were recorded on site, and none have been known from Greenridge previously.

Grey-headed Flying-fox surveys were not undertaken on Greenridge as the REs present are known to be of high value to the species, Greenridge is within 20 km of 20 flying-fox camps used by Grey-headed Flying-fox and the species has been recorded from Greenridge previously, foraging on *Melaleuca quinquenervia* and *Eucalyptus tereticornis* (ddwfauna 2006). During Koala surveys in 2022, the EVE Koala survey team noted heavy flying-fox use of flowering Eucalypts on site (pers comm. Deidre de Villiers). Grey-headed Flying-fox is expected to forage on site regularly during Eucalyptus and Melaleuca flowering events.

4.0 SURVEY RESULTS

4.1 HABITAT QUALITY SURVEYS

4.1.1 Assessment Units

In accordance with the methods of the *Guide to Determining Terrestrial Habitat Quality – Version 1.3* (the guide) Greenridge was mapped into like Assessment Units (AUs), differentiated based on:

- Regional ecosystem type; and
- Vegetation condition (remnant, advanced regrowth, young regrowth or cleared).

Ground-truthing of a number of polygons of the RE types supporting *Casuarina glauca* was undertaken through applying the quaternary survey method of Neldner *et al.* (2017). Field observations and the use of historical aerial photography contributed to delineation of the regrowth vegetation.

A brief description of each AU is provided below, and the AU mapping results and field survey locations are shown in Figure 4.1.

AU1 REMNANT RE 12.1.1: 14.2ha. Remnant *Casuarina glauca* open forest. Wholly analogous with the Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and Southeast Queensland Threatened Ecological Community.

AU2 REGROWTH RE 12.1.1: 5.16ha. Regrowth *Casuarina glauca* open forest.

AU3 NON-REMNANT RE 12.1.1: 22.15ha. Non-remnant *Casuarina glauca* open forest (presently grassland).

AU4 REMNANT RE 12.3.20: 28.7ha. Remnant *Casuarina glauca*, *Eucalyptus tereticornis* and *Melaleuca quinquenervia* open forest. Where dominated by *Casuarina glauca* the community is analogous with the Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and Southeast Queensland Threatened Ecological Community.

AU5 REGROWTH RE 12.3.20: 4.77ha. Regrowth *Casuarina glauca*, *Eucalyptus tereticornis* and *Melaleuca quinquenervia* open forest.

AU6 NON-REMNANT RE 12.3.20: 11.88ha. Non-remnant *Casuarina glauca*, *Eucalyptus tereticornis* and *Melaleuca quinquenervia* open forest (presently grassland).

4.1.2 Habitat Quality Surveys

The guide suggests the number of Habitat Quality/BioCondition transect surveys that should be undertaken within each AU to represent the condition of each AU (Table 4.1). Table 4.2 provides a breakdown of AUs for Greenridge as shown in Figure 4.1, their total areas and the number of BioCondition transect surveys undertaken within each.

Table 4.1 Sampling sites relative to AU size

AU size (ha)	Suggested no. of sampling sites
0-50	At least 2
50-100	Three
100-500	Four
500-1000	Five
>1000	Six

Table 4.2 AU Areas and BioCondition Transects completed

AU description	Area (ha)	Suggested transects	Transects completed
AU1 RE 12.1.1 remnant	14.2	≥2	3
AU 2 RE 12.1.1 regrowth	5.16	≥2	2
AU3 RE 12.1.1 non rem (preclear)	22.15	≥2	2
AU4 RE 12.3.20 remnant	28.7	≥2	3
AU5 RE 12.3.20 regrowth	4.77	≥2	2
AU6 RE 12.3.20 non rem (preclear)	11.88	≥2	2

Results of the Habitat Quality/BioCondition transects are provided in Appendix 2.

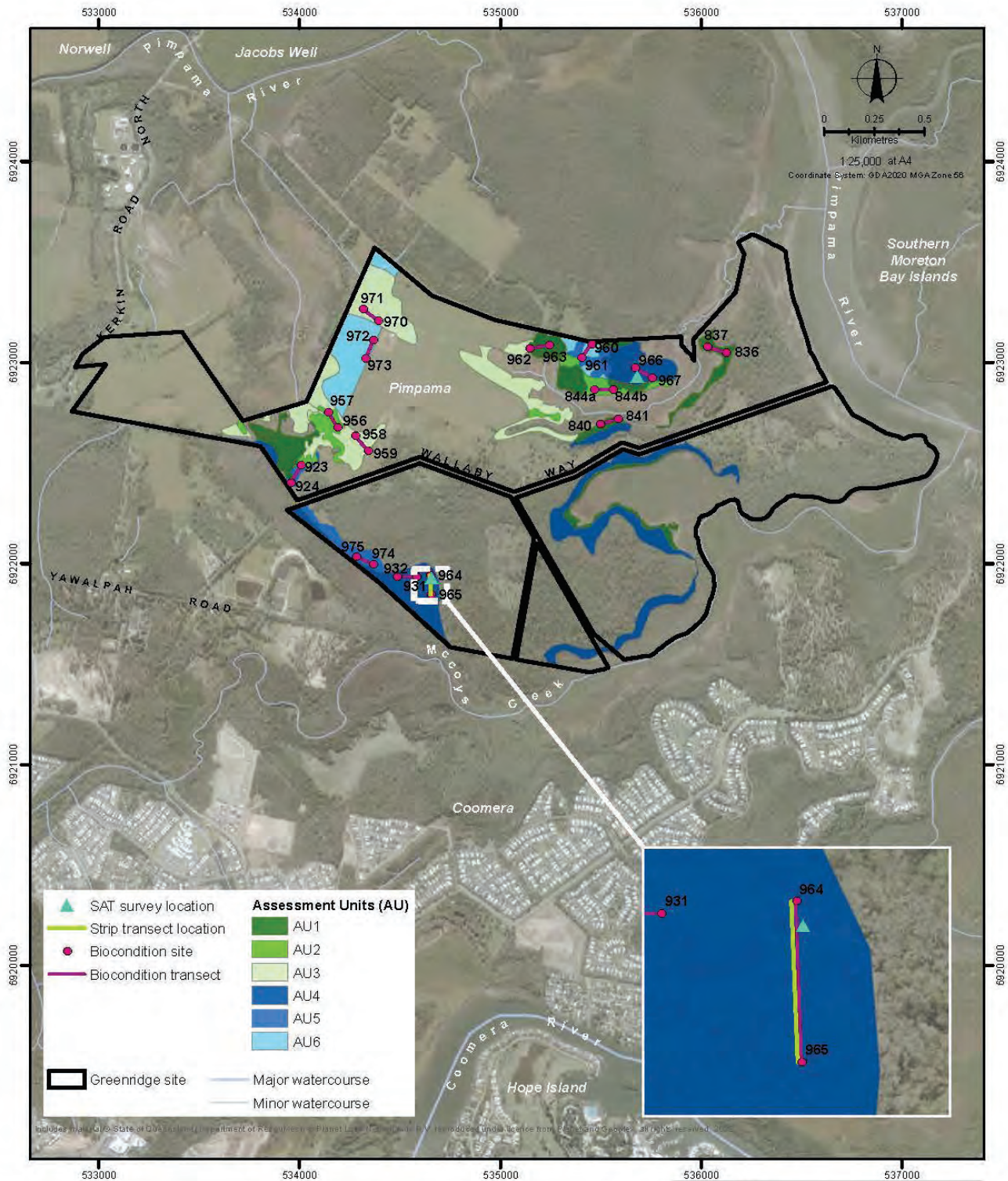


Figure: 4.1
Title: AU mapping results and survey locations

Project: Greenridge Offset Property Assessment Results
 Coomera Connector Stage 1 – EPBC 2020/8646
Client: Queensland Department of Transport and Main Roads



4.2 THERMAL IMAGING DRONE SURVEYS

Endeavour Veterinary Ecology (EVE) was commissioned by TMR to conduct thermal imaging drone surveys over an area that included the Greenridge property. The survey was conducted between December 2021 and January 2022 over six nights. During that survey 68 Koalas were detected at the locations shown in Image 8.

Applying the estimated detection rates of 0.65 and 0.85, the study concluded Greenridge supported a population of 80 to 105 Koalas (EVE 2022). The full report is provided as Appendix 1.

When the drone records are overlaid on ground-truthed RE mapping for Greenridge, nine Koalas were recorded within 27.52 ha of remnant RE 12.3.20. Corrected for an average 0.75 detection rate (75% of Koalas detected), remnant RE 12.3.20 supported approximately 0.4 Koalas per hectare at the time of survey. This is consistent with the findings of Biolink (2017) which reported Koala densities of 0.34/ha based on SAT search area and 0.47/ha based on Strip Transect search data for the East Coomera area.

Image 5. Location of 68 koalas detected by thermal drone surveys (source: EVE 2022)



4.3 KOALA SAT AND STRIP TRANSECT SURVEYS

Two Koala SAT surveys and two Strip Transect surveys were undertaken with AU4. An additional SAT survey and Strip Transect survey was carried out in the eastern portion of Greenridge in State-mapped RE 12.3.20; however, the mapped RE 12.3.20 at this location was subsequently ground-truthed as a heterogeneous polygon comprised of three separate REs (including 12.3.20) and the survey results at that location are therefore not considered representative of a homogenous polygon of 12.3.20.

No Koala scats were recorded from the two SAT surveys undertaken within AU4 and no Koalas were recorded from the two Strip Transects undertaken within AU4.

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APPENDIX 1

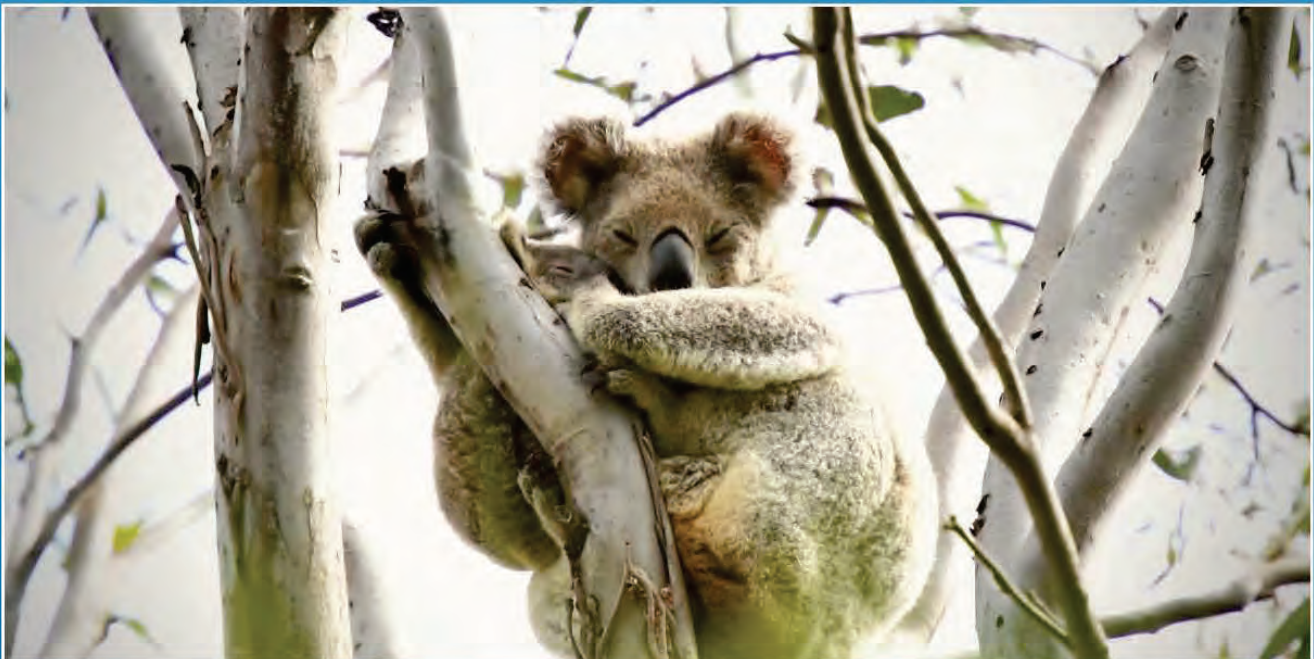
December 2021/January 2022 Koala Thermal Survey Report



Koala Survey and Monitoring

Thermal koala survey

GREENRIDGE SITE Dec. 2021 - Jan. 2022



Greenridge thermal drone survey

Background

Drones are increasingly being used for ecological applications such as surveys of flora and fauna and wildlife management activities. Surveys of koalas are ideally suited to thermal imaging drone surveys as they are cryptic in nature and the detection rate of koalas using traditional transect (ground) surveys can vary widely depending on factors such as the vegetation type and cover and the experience of the survey team.

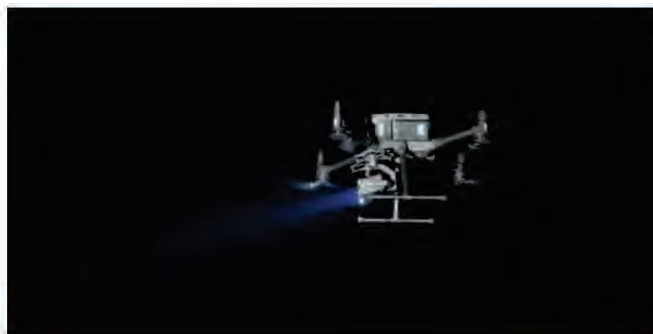
Endeavour Veterinary Ecology (EVE) was engaged by the Department of Transport and Main Roads to conduct koala surveys in areas within and adjacent to the Coomera Connector corridor. Surveys to determine the distribution and abundance, health, and reproductive status of local koala populations are essential to effectively understand and manage the long-term viability of these populations. EVE conducted surveys of the PRCA and Greenridge site to assess the distribution and estimate the number of koalas residing on the site. Both sites were surveyed as this area is somewhat isolated and the koala populations on both sites are closely linked and from an ecological perspective, can be considered a single population. The health of the PRCA koalas is being actively managed through capture, the fitting of monitoring devices and comprehensive health assessments and treatment of sick animals.

Methods

Drone surveys were conducted over 13 nights from 2 December 2021 to 10 February 2022, with the Greenridge site surveyed over 6 nights. All areas of koala habitat were surveyed, except for two small areas on the site (approx 9.5 ha in total) where site terrain made it difficult to maintain visual line of sight of the drone (a Civil Aviation Safety Authority requirement). The area was divided into 6 discrete search polygons and each area was systematically searched in an 'up-and-back' lawn-mower pattern using a Matrice 300 RTK (M300) with H20T camera (dual optical and thermal).

Thermal heat signatures suggestive of koalas were investigated to positively identify the origin of the heat source. Where a koala was identified, the location of the koala was determined using a laser rangefinder and the GPS coordinates recorded in a spreadsheet and a reference screen shot of the koala with the coordinates was saved. Coordinates and drone flight paths were plotted on Google Earth and any obvious duplicate detections were deleted.

Detection rates were estimated based on the known locations of existing radio-tagged koalas and the proportion of animals detected or missed on any given night. We estimated our detection rate ranged between 0.65 and 0.85 (65% to 85% of koalas detected). As with traditional surveys, thermal drone detections of koalas are impeded by vegetation type/canopy density, the experience of the spotters, as well as environmental conditions where warm temperatures and water bodies can mask heat signatures by reducing the temperature differential between the environment and the koala.



Results

In total, 68 koalas were detected on site (Figure 1) during thermal drone surveys of areas of koala habitat. These detections were all positively identified as koalas using optical imaging. Based on our estimated detection rate where we know koalas are missed, the estimated numbers of koalas at the Greenridge site was estimated to be between 80 and 105 animals, where 68 detections at a detection rate of 85% equates to approximately 80 animals and a 65% detection rate equates to approximately 105 animals.



FIGURE 1. LOCATION OF THE 68 KOALAS DETECTED BY THERMAL DRONE SURVEYS IN THE PRCA AND THE GREENRIDGE SITE.

Discussion

Thermal drone surveys are becoming an increasingly common method of surveying flora and fauna. Koalas are ideally suited to night time thermal surveys as: 1. Animals are most active in the tops of the canopies feeding at night; and, 2. Koalas are a relatively large animal with an often-distinctive heat signature that can be detected well above the tree canopy by thermal cameras and can result in a greater detection of animals than traditional ground-based surveys. However, as is the case with any survey method, there are limitations to the use of thermal drones for koala population surveys where an understanding of detailed population metrics is required. Besides the legal requirements enforced by CASA around the use of drones, when koalas are detected, the assessment of the sex, reproductive and health status of the animal is often not possible. Ground-based field validation and monitoring of koalas is still an important component of koala population management.

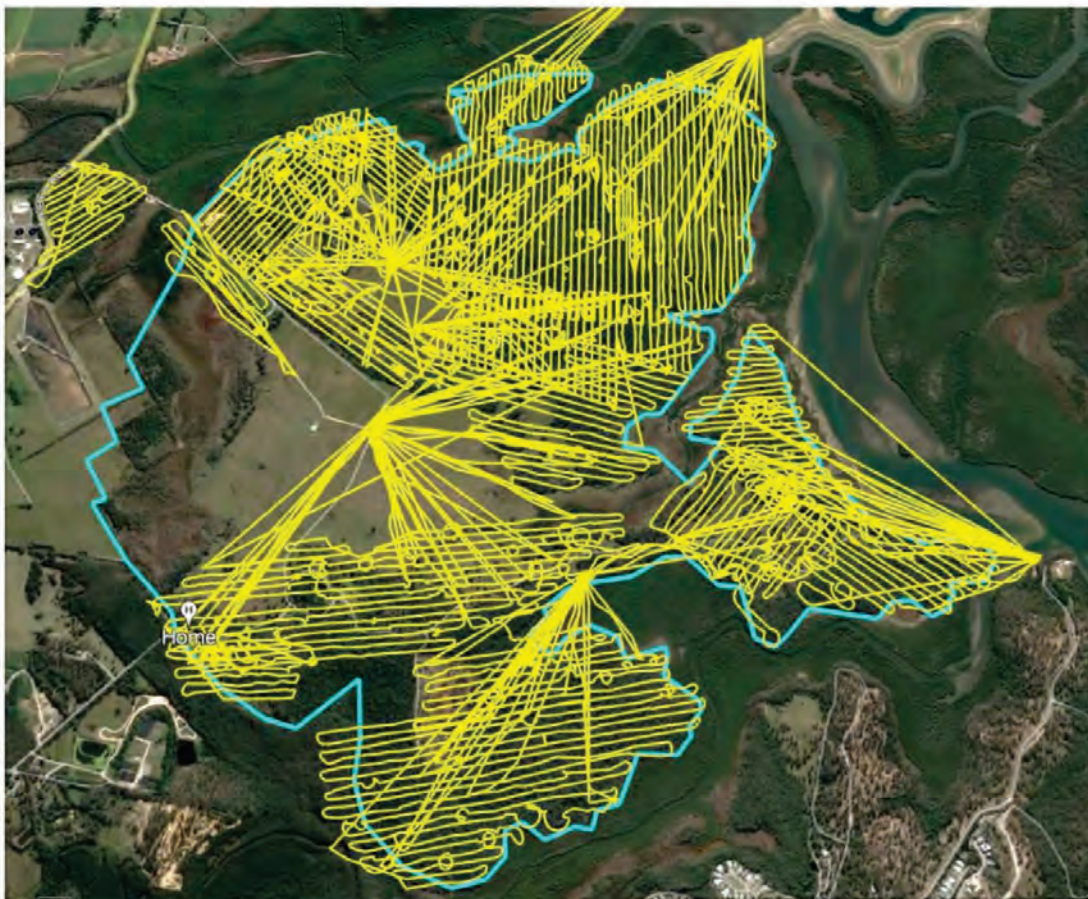


FIGURE 2. DRONE SURVEY TRANSECTS COVERED ALMOST ALL AREAS OF KOALA HABITAT WITHIN THE PRCA AND GREENRIDGE SITE.

For further information please use the following contacts:

Email:

coomeraconnector@tmr.qld.gov.au

Phone:

1800 568 978

Post:

Department of Transport and Main Roads
PO Box 442
NERANG QLD 4211

APPENDIX 2

BioCondition Survey Data

[illegible]

Category	Sub-category	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Category 1	Sub-category 1.1	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7	1.1.8	1.1.9	1.1.10	1.1.11	1.1.12	1.1.13	1.1.14	1.1.15	1.1.16	1.1.17	1.1.18	1.1.19	1.1.20
	Sub-category 1.2	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7	1.2.8	1.2.9	1.2.10	1.2.11	1.2.12	1.2.13	1.2.14	1.2.15	1.2.16	1.2.17	1.2.18	1.2.19	1.2.20
	Sub-category 1.3	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7	1.3.8	1.3.9	1.3.10	1.3.11	1.3.12	1.3.13	1.3.14	1.3.15	1.3.16	1.3.17	1.3.18	1.3.19	1.3.20
	Sub-category 1.4	1.4.1	1.4.2	1.4.3	1.4.4	1.4.5	1.4.6	1.4.7	1.4.8	1.4.9	1.4.10	1.4.11	1.4.12	1.4.13	1.4.14	1.4.15	1.4.16	1.4.17	1.4.18	1.4.19	1.4.20
	Sub-category 1.5	1.5.1	1.5.2	1.5.3	1.5.4	1.5.5	1.5.6	1.5.7	1.5.8	1.5.9	1.5.10	1.5.11	1.5.12	1.5.13	1.5.14	1.5.15	1.5.16	1.5.17	1.5.18	1.5.19	1.5.20
	Sub-category 1.6	1.6.1	1.6.2	1.6.3	1.6.4	1.6.5	1.6.6	1.6.7	1.6.8	1.6.9	1.6.10	1.6.11	1.6.12	1.6.13	1.6.14	1.6.15	1.6.16	1.6.17	1.6.18	1.6.19	1.6.20
	Sub-category 1.7	1.7.1	1.7.2	1.7.3	1.7.4	1.7.5	1.7.6	1.7.7	1.7.8	1.7.9	1.7.10	1.7.11	1.7.12	1.7.13	1.7.14	1.7.15	1.7.16	1.7.17	1.7.18	1.7.19	1.7.20
	Sub-category 1.8	1.8.1	1.8.2	1.8.3	1.8.4	1.8.5	1.8.6	1.8.7	1.8.8	1.8.9	1.8.10	1.8.11	1.8.12	1.8.13	1.8.14	1.8.15	1.8.16	1.8.17	1.8.18	1.8.19	1.8.20
	Sub-category 1.9	1.9.1	1.9.2	1.9.3	1.9.4	1.9.5	1.9.6	1.9.7	1.9.8	1.9.9	1.9.10	1.9.11	1.9.12	1.9.13	1.9.14	1.9.15	1.9.16	1.9.17	1.9.18	1.9.19	1.9.20
	Sub-category 1.10	1.10.1	1.10.2	1.10.3	1.10.4	1.10.5	1.10.6	1.10.7	1.10.8	1.10.9	1.10.10	1.10.11	1.10.12	1.10.13	1.10.14	1.10.15	1.10.16	1.10.17	1.10.18	1.10.19	1.10.20
	Sub-category 1.11	1.11.1	1.11.2	1.11.3	1.11.4	1.11.5	1.11.6	1.11.7	1.11.8	1.11.9	1.11.10	1.11.11	1.11.12	1.11.13	1.11.14	1.11.15	1.11.16	1.11.17	1.11.18	1.11.19	1.11.20
	Sub-category 1.12	1.12.1	1.12.2	1.12.3	1.12.4	1.12.5	1.12.6	1.12.7	1.12.8	1.12.9	1.12.10	1.12.11	1.12.12	1.12.13	1.12.14	1.12.15	1.12.16	1.12.17	1.12.18	1.12.19	1.12.20
	Sub-category 1.13	1.13.1	1.13.2	1.13.3	1.13.4	1.13.5	1.13.6	1.13.7	1.13.8	1.13.9	1.13.10	1.13.11	1.13.12	1.13.13	1.13.14	1.13.15	1.13.16	1.13.17	1.13.18	1.13.19	1.13.20
	Sub-category 1.14	1.14.1	1.14.2	1.14.3	1.14.4	1.14.5	1.14.6	1.14.7	1.14.8	1.14.9	1.14.10	1.14.11	1.14.12	1.14.13	1.14.14	1.14.15	1.14.16	1.14.17	1.14.18	1.14.19	1.14.20
	Sub-category 1.15	1.15.1	1.15.2	1.15.3	1.15.4	1.15.5	1.15.6	1.15.7	1.15.8	1.15.9	1.15.10	1.15.11	1.15.12	1.15.13	1.15.14	1.15.15	1.15.16	1.15.17	1.15.18	1.15.19	1.15.20
	Sub-category 1.16	1.16.1	1.16.2	1.16.3	1.16.4	1.16.5	1.16.6	1.16.7	1.16.8	1.16.9	1.16.10	1.16.11	1.16.12	1.16.13	1.16.14	1.16.15	1.16.16	1.16.17	1.16.18	1.16.19	1.16.20
	Sub-category 1.17	1.17.1	1.17.2	1.17.3	1.17.4	1.17.5	1.17.6	1.17.7	1.17.8	1.17.9	1.17.10	1.17.11	1.17.12	1.17.13	1.17.14	1.17.15	1.17.16	1.17.17	1.17.18	1.17.19	1.17.20
	Sub-category 1.18	1.18.1	1.18.2	1.18.3	1.18.4	1.18.5	1.18.6	1.18.7	1.18.8	1.18.9	1.18.10	1.18.11	1.18.12	1.18.13	1.18.14	1.18.15	1.18.16	1.18.17	1.18.18	1.18.19	1.18.20
	Sub-category 1.19	1.19.1	1.19.2	1.19.3	1.19.4	1.19.5	1.19.6	1.19.7	1.19.8	1.19.9	1.19.10	1.19.11	1.19.12	1.19.13	1.19.14	1.19.15	1.19.16	1.19.17	1.19.18	1.19.19	1.19.20
	Sub-category 1.20	1.20.1	1.20.2	1.20.3	1.20.4	1.20.5	1.20.6	1.20.7	1.20.8	1.20.9	1.20.10	1.20.11	1.20.12	1.20.13	1.20.14	1.20.15	1.20.16	1.20.17	1.20.18	1.20.19	1.20.20
Category 2	Sub-category 2.1	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8	2.1.9	2.1.10	2.1.11	2.1.12	2.1.13	2.1.14	2.1.15	2.1.16	2.1.17	2.1.18	2.1.19	2.1.20
	Sub-category 2.2	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10	2.2.11	2.2.12	2.2.13	2.2.14	2.2.15	2.2.16	2.2.17	2.2.18	2.2.19	2.2.20
	Sub-category 2.3	2.3.1	2.3.2	2.3.3	2.3.4	2.3.5	2.3.6	2.3.7	2.3.8	2.3.9	2.3.10	2.3.11	2.3.12	2.3.13	2.3.14	2.3.15	2.3.16	2.3.17	2.3.18	2.3.19	2.3.20
	Sub-category 2.4	2.4.1	2.4.2	2.4.3	2.4.4	2.4.5	2.4.6	2.4.7	2.4.8	2.4.9	2.4.10	2.4.11	2.4.12	2.4.13	2.4.14	2.4.15	2.4.16	2.4.17	2.4.18	2.4.19	2.4.20
	Sub-category 2.5	2.5.1	2.5.2	2.5.3	2.5.4	2.5.5	2.5.6	2.5.7	2.5.8	2.5.9	2.5.10	2.5.11	2.5.12	2.5.13	2.5.14	2.5.15	2.5.16	2.5.17	2.5.18	2.5.19	2.5.20
	Sub-category 2.6	2.6.1	2.6.2	2.6.3	2.6.4	2.6.5	2.6.6	2.6.7	2.6.8	2.6.9	2.6.10	2.6.11	2.6.12	2.6.13	2.6.14	2.6.15	2.6.16	2.6.17	2.6.18	2.6.19	2.6.20
	Sub-category 2.7	2.7.1	2.7.2	2.7.3	2.7.4	2.7.5	2.7.6	2.7.7	2.7.8	2.7.9	2.7.10	2.7.11	2.7.12	2.7.13	2.7.14	2.7.15	2.7.16	2.7.17	2.7.18	2.7.19	2.7.20
	Sub-category 2.8	2.8.1	2.8.2	2.8.3	2.8.4	2.8.5	2.8.6	2.8.7	2.8.8	2.8.9	2.8.10	2.8.11	2.8.12	2.8.13	2.8.14	2.8.15	2.8.16	2.8.17	2.8.18	2.8.19	2.8.20
	Sub-category 2.9	2.9.1	2.9.2	2.9.3	2.9.4	2.9.5	2.9.6	2.9.7	2.9.8	2.9.9	2.9.10	2.9.11	2.9.12	2.9.13	2.9.14	2.9.15	2.9.16	2.9.17	2.9.18	2.9.19	2.9.20
	Sub-category 2.10	2.10.1	2.10.2	2.10.3	2.10.4	2.10.5	2.10.6	2.10.7	2.10.8	2.10.9	2.10.10	2.10.11	2.10.12	2.10.13	2.10.14	2.10.15	2.10.16	2.10.17	2.10.18	2.10.19	2.10.20
Category 3	Sub-category 3.1	3.1.1	3.1.2	3.1.3	3.1.4	3.1.5	3.1.6	3.1.7	3.1.8	3.1.9	3.1.10	3.1.11	3.1.12	3.1.13	3.1.14	3.1.15	3.1.16	3.1.17	3.1.18	3.1.19	3.1.20
	Sub-category 3.2	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.2.6	3.2.7	3.2.8	3.2.9	3.2.10	3.2.11	3.2.12	3.2.13	3.2.14	3.2.15	3.2.16	3.2.17	3.2.18	3.2.19	3.2.20
	Sub-category 3.3	3.3.1	3.3.2	3.3.3	3.3.4	3.3.5	3.3.6	3.3.7	3.3.8	3.3.9	3.3.10	3.3.11	3.3.12	3.3.13	3.3.14	3.3.15	3.3.16	3.3.17	3.3.18	3.3.19	3.3.20
	Sub-category 3.4	3.4.1	3.4.2	3.4.3	3.4.4	3.4.5	3.4.6	3.4.7	3.4.8	3.4.9	3.4.10	3.4.11	3.4.12	3.4.13	3.4.14	3.4.15	3.4.16	3.4.17	3.4.18	3.4.19	3.4.20
	Sub-category 3.5	3.5.1	3.5.2	3.5.3	3.5.4	3.5.5	3.5.6	3.5.7	3.5.8	3.5.9	3.5.10	3.5.11	3.5.12	3.5.13	3.5.14	3.5.15	3.5.16	3.5.17	3.5.18	3.5.19	3.5.20
	Sub-category 3.6	3.6.1	3.6.2	3.6.3	3.6.4	3.6.5	3.6.6	3.6.7	3.6.8	3.6.9	3.6.10	3.6.11	3.6.12	3.6.13	3.6.14	3.6.15	3.6.16	3.6.17	3.6.18	3.6.19	3.6.20
	Sub-category 3.7	3.7.1	3.7.2	3.7.3	3.7.4	3.7.5	3.7.6	3.7.7	3.7.8	3.7.9	3.7.10	3.7.11	3.7.12	3.7.13	3.7.14	3.7.15	3.7.16	3.7.17	3.7.18	3.7.19	3.7.20
	Sub-category 3.8	3.8.1	3.8.2	3.8.3	3.8.4	3.8.5	3.8.6	3.8.7	3.8.8	3.8.9	3.8.10	3.8.11	3.8.12	3.8.13	3.8.14	3.8.15	3.8.16	3.8.17	3.8.18	3.8.19	3.8.20
	Sub-category 3.9	3.9.1	3.9.2	3.9.3	3.9.4	3.9.5	3.9.6	3.9.7	3.9.8	3.9.9	3.9.10	3.9.11	3.9.12	3.9.13	3.9.14	3.9.15	3.9.16	3.9.17	3.9.18	3.9.19	3.9.20
	Sub-category 3.10	3.10.1	3.10.2	3.10.3	3.10.4	3.10.5	3.10.6	3.10.7	3.10.8	3.10.9	3.10.10	3.10.11	3.10.12	3.10.13	3.10.14	3.10.15	3.10.16	3.10.17	3.10.18	3.10.19	3.10.20

GREENRIDGE BIOCONDITION SURVEY SITE PHOTOS

Site No	North	East	South	West
836-837 AU1 RE 12.1.1 Remnant				
840-841 AU1 RE 12.1.1 Remnant				
962-963 AU1 RE 12.1.1 Remnant				
844a-844b AU2 RE 12.1.1 Regrowth				




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GREENRIDGE BIOCONDITION SURVEY SITE PHOTOS

Site No	North	East	South	West
956-957 AU2 RE 12.1.1 Regrowth				
958-959 AU3 RE 12.1.1 Non-remnant				
970-971 AU3 RE 12.1.1 Non remnant				
931-932 AU4 RE 12.3.20 Remnant				





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GREENRIDGE BIOCONDITION SURVEY SITE PHOTOS

Site No	North	East	South	West
964-965 AU4 RE 12.3.20 Remnant				
966-967 AU4 RE 12.3.20 Remnant				
974-975 AU5 Re 12.3.20 Regrowth				
923-924 AU5 RE 12.3.20 Regrowth				

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GREENRIDGE BIOCONDITION SURVEY SITE PHOTOS

Site No	North	East	South	West
972-973 AU6 RE 12.3.20 Non remnant				
960-961 AU6 RE 12.3.20 Non-remnant		